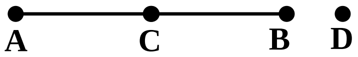
Sheet (1)
Geometric Concepts

[1] The line segment:

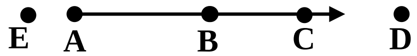
It is the set of points between two distinct points and denoted by $\overline{AB}$ or $\overline{BA}$



$AB = 6\,cm$, $C \in \overline{AB}$, $D \notin \overline{AB}$

[2] The ray:

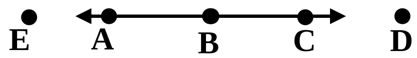
It is a line segment extended from only one of its terminals infintly and denoted by $\overrightarrow{AB}$



$C \in \overrightarrow{AB}$, $D \in \overrightarrow{AB}$, $E \notin \overrightarrow{AB}$, $\overline{AB} \subset \overrightarrow{AB}$, $\overrightarrow{AB} \neq \overrightarrow{BA}$

[3] The straight line:

It is a line segment extended from its two terminals infinitely and denoted by $\overleftrightarrow{AB}$ or $\overleftrightarrow{BA}$



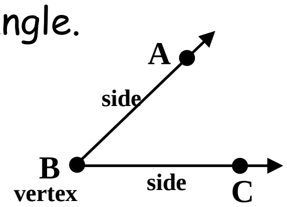
$C \in \overleftrightarrow{AB}$, $D \in \overleftrightarrow{AB}$, $E \in \overleftrightarrow{AB}$, $\overline{AB} \subset \overrightarrow{AB} \subset \overleftrightarrow{AB}$

[4] The plane:

A plane is a flat unbounded surface and it is extended without limit in all directions.

[5] The angle:

It is the union of two rays having the same starting point (vertex of the angle) the two rays are called two sides of the angle.

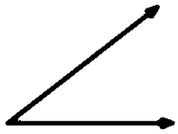


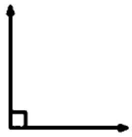
$\angle ABC$, $\angle CBA$ or $\angle B$

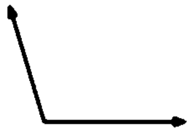
$\overrightarrow{BC} \cup \overrightarrow{BA} = \angle ABC$

Types of angles:

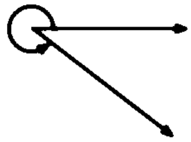
(1) **Zero angle**: Its measure = 0°.

(2) **Acute angle**: 0° < its measure < 90°. 

(3) **Right angle**: Its measure = 90°. 

(4) **Obtuse angle**: 90° < its measure < 180°. 

(5) **Straight angle**: Its measure = 180°. 

(6) **Reflex angle**: 180° < its measure < 360°. 

[1] Complete the following table:

$m(\angle B)$	50°	……	105°	……	179°	……	$115^o\ 46'$	……
$m(\text{reflex } \angle B)$	……	330°	……	237°	……	350°	……	$200^o\ 19'\ 30''$

[2] Mention the type of the angle whose measure is as follows:

(1) 57° …………………

(2) 117° …………………

(3) 90° …………………

(4) 200° …………………

(5) 180° …………………

(6) $43\frac{1}{2}^o$ …………………

(7) $179^o\ 62'$ …………………

(8) $90\frac{2}{5}^o$ …………………

[3] From the opposite figure,
complete using (∈), (∉), (⊂) or (⊄):

(1) A ……… $\overrightarrow{DC}$

(2) D ……… $\overline{AC}$

(3) C ……… $\overleftrightarrow{AB}$

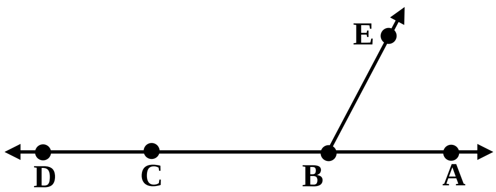
(4) A ……… $\angle EBC$

(5) $\overline{DC}$ ……… $\overleftrightarrow{AB}$

(6) $\overline{BC}$ ……… $\overrightarrow{BA}$

(7) $\overrightarrow{BA}$ ……… $\overleftrightarrow{DC}$

(8) $\overline{AC}$ ……… $\overline{AD}$

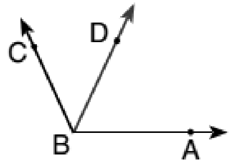


Sheet (2)

Some Relations Between Angles

Adjacent angles

Two angles are said to be adjacent if they have a common vertex, a common side and the other two sides are on opposite sides of the common side.



∠ABD, ∠DBC are adjacent

Complementary angles

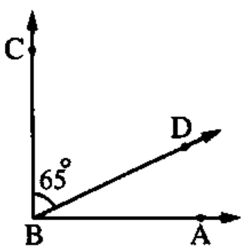
Two angles are said to be complementary if their sum is 90°.

And the two outer sides are perpendicular

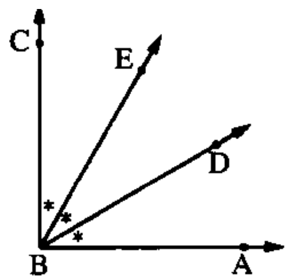
[1] Write the measure of the angle which complements each of the angles whose measures are as follow:

(1) 30° …………………	(2) 60° …………………
(3) 48° …………………	(4) 0° …………………
(5) 90° …………………	(6) $22\frac{1}{2}^\circ$ …………………
(7) $25^\circ\,30'$ …………………	(8) $53\frac{1}{4}^\circ$ …………………

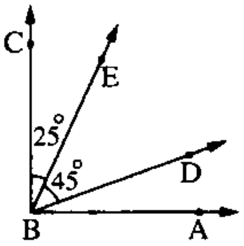
[2] In each of the following figures $\overrightarrow{BA} \perp \overrightarrow{BC}$, Complete:



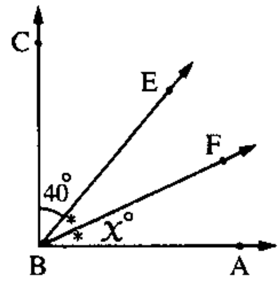
(1) m (∠ ABD) = ……….°



(2) m (∠ DBC) = ……….°



(3) m (∠ ABD) = ...°

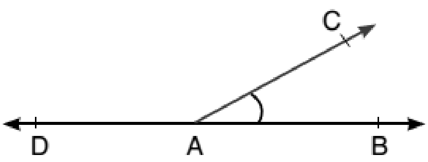


(4) x = ...°

Supplementary angles

Two angles are said to be supplementary if their sum is 180°.

Two adjacent angles formed by a straight line and a ray with a starting point on this straight line are supplementary



m (∠BAC) + m (∠CAD) = 180°

[3] Write the measure of the angle which supplements each of the angles whose measures are as follow:

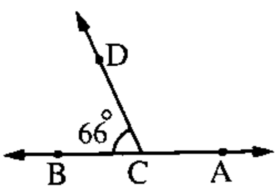
(1) 20° .... (2) 90° ....

(3) 152° .... (4) 0° ....

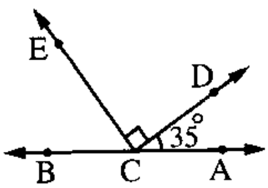
(5) 180° .... (6) $92\frac{1}{2}^{\circ}$ ....

(7) $141^{\circ}\,24'$ .... (8) 10° ....

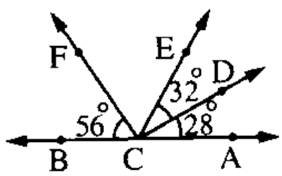
[4] In each of the following figures $C \in \overleftrightarrow{AB}$, Complete:



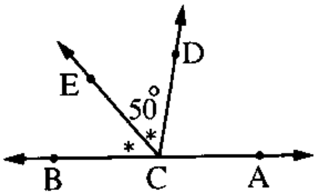
(1) m (∠ ACD) = ...°



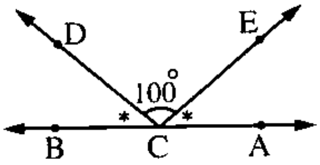
(2) m (∠ ECB) = ...°



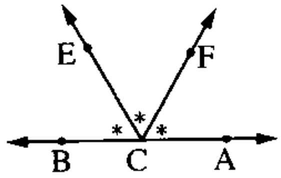
(3) m (∠ ECF) = ...°



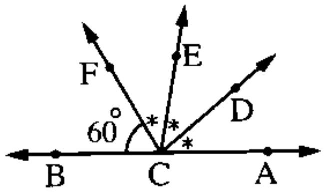
(4) m (∠ ACD) = ……….°



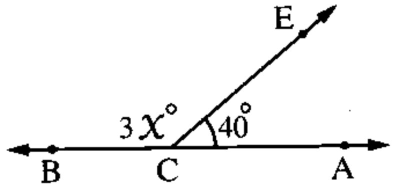
(5) m (∠ DCB) = ……….°



(6) m (∠ FCB) = ……….°



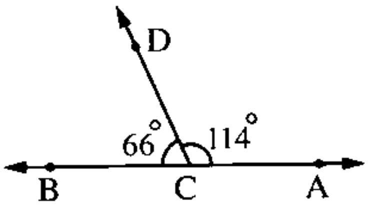
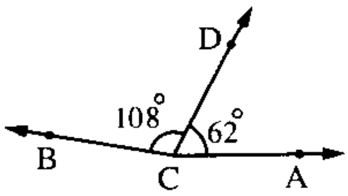
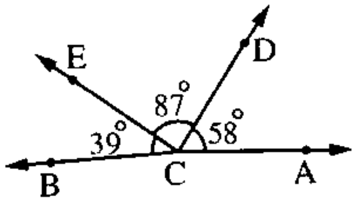
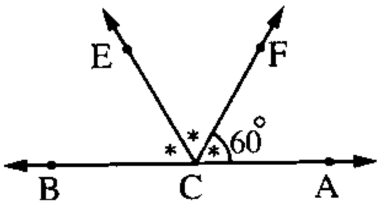
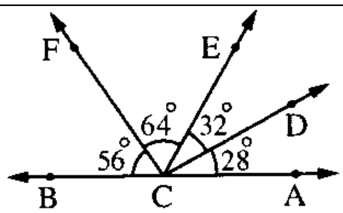
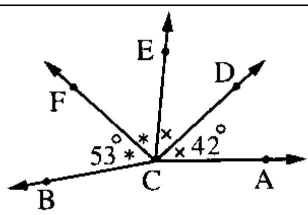
(7) m (∠ DCB) = ……….°



(8) χ = ……… °

> If two adjacent angles are supplementary then their outer sides are on the same straight line.

[5] In each of the following figures, state if $\overrightarrow{CA}$ and $\overrightarrow{CB}$ are on the same straight line or not, and why?

 …………………………………… …………………………………… ……………………………………	 …………………………………… …………………………………… ……………………………………	 …………………………………… …………………………………… ……………………………………
 …………………………………… …………………………………… ……………………………………	 …………………………………… …………………………………… ……………………………………	 …………………………………… …………………………………… ……………………………………

[6] Complete the following:

(1)	The angle is ··········
(2)	The measure of the straight angle = ·········· ° and the measure of zero angle is ·········· °
(3)	The measure of the right angle = ·········· °
(4)	The acute angle is the angle whose measure is less than ·········· and more than ··········
(5)	The two complement angles are the two angles whose sum of their measures is ··········
(6)	The two supplement angles are the two angles whose sum of their measures is ··········
(7)	The two adjacent angles formed by a straight line and a ray with a starting point on this straight line are ··········
(8)	If the two outer sides of two adjacent angles are perpendicular , then these two adjacent angles are ··········
(9)	If the two outer sides of two adjacent angles are on the same straight line, then these two adjacent angles are ··········
(10)	If the two adjacent angles are supplementary , then their outer sides are ··········
(11)	If the sum of measures of two adjacent angles does not equal 180° , then their outer sides are ··········
(12)	The measure of the angle which is equivalent to two right angles = ·········· and it is called ·········· angle.
(13)	The angle whose measure is 50° complements an angle of measures ·········· and supplements the angle whose measure is ··········
(14)	The angle whose measure ·········· complements the angle whose measure is 30° and supplements the angle whose measure is ··········
(15)	The angle whose measure ·········· complements the angle whose measure is ·········· and supplements the angle whose measure is 150°
(16)	The acute angle complements ·········· angle and supplements ·········· angle.
(17)	Zero angle is complemented by ·········· angle and is supplemented by ·········· angle.
(18)	The right angle is complemented by ·········· angle and is supplemented by ·········· angle.

[7] Choose the correct answer:

(1) The obtuse angle supplements ………. angle.

(a) obtuse (b) right (c) acute (d) straight

(2) Between any two distinct points we can draw ………. straight line passing through them.

(a) zero (b) 1 (c) 2 (d) 3

(3) If : $m(\angle A) + m(\angle B) = 180°$, then $\angle A$ and $\angle B$ are ……….

(a) equal in measure. (b) complementary.
(c) supplementary. (d) adjacent.

(4) If : $\overrightarrow{BA} \perp \overrightarrow{BC}$, then $m(\angle ABC) =$ ……….

(a) 40° (b) 90° (c) 180° (d) 360°

(5) If : $\angle A$ supplements $\angle B$, $\angle A$ supplements $\angle C$, then $\angle B$ and $\angle C$ are ……….

(a) equal in measure. (b) complementary.
(c) supplementary. (d) adjacent.

(6) If : $m(\angle X) = 15°$, then the two angles whose measures are $2\,m(\angle X)$, $4\,m(\angle X)$ are ……….

(a) complementary. (b) supplementary.
(c) equal in measure. (d) obtuse angles.

(7) If : $m(\angle A) = 2\,m(\angle B)$, $\angle A$ supplements $\angle B$, then $m(\angle B) =$ ……….

(a) 30° (b) 60° (c) 120° (d) 90°

(8) $\overline{AB}$ ………. $\overrightarrow{AB}$

(a) $\in$ (b) $\notin$ (c) $\subset$ (d) $\not\subset$

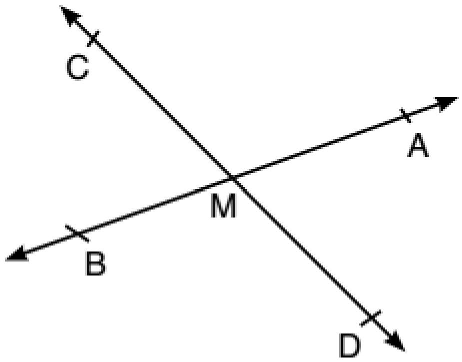
(9) If : $m(\angle X) = 2\,m(\angle Y)$ and $\angle Y$ is an obtuse angle, then $\angle X$ is ……….

(a) acute. (b) right. (c) obtuse. (d) reflex.

Sheet (3)

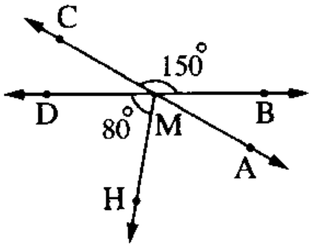
Some Relations Between Angles (follow)

vertically opposite angles

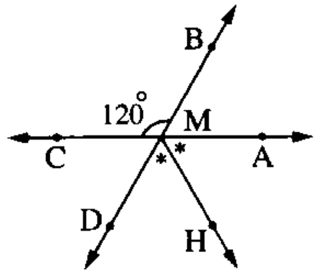


> If two straight lines intersect, then the measures of each two vertically opposite angles are equal.

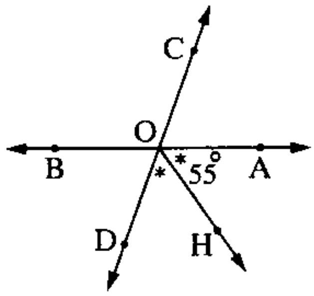
[1] In each figure, find the measure of the required angle:



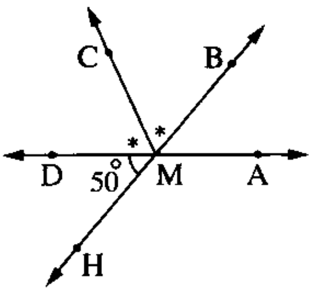
(1) m (∠ AMH) = ……….°



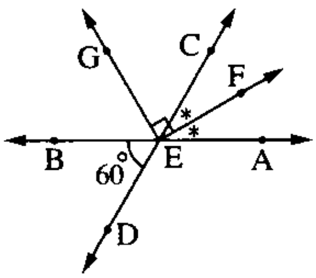
(2) m (∠ HMD) = ……….°



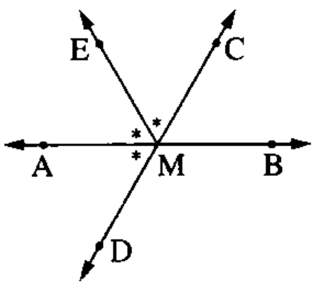
(3) m (∠ COB) = ……….°



(4) m (∠ AMC) = ……….°



(5) m (∠ GEB) = ……….°

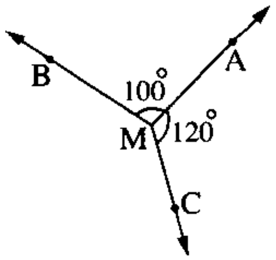


(6) m (∠ DMB) = ……….°

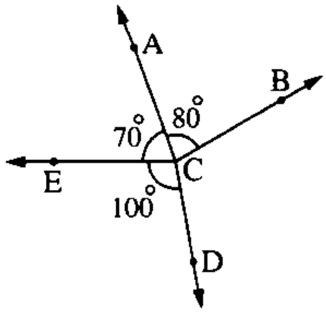
Accumulative angles at a point

The sum of the measures of the accumulative angles at a point is 360°

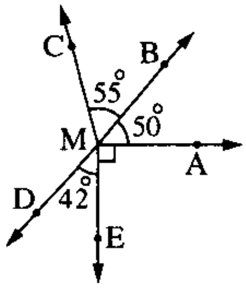
[2] In each figure, find the measure of the required angle:



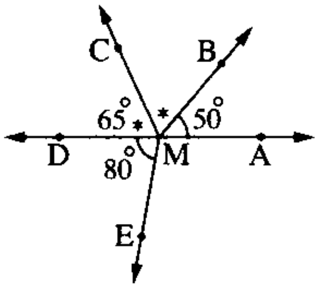
(7) m (∠ BMC) = ...°



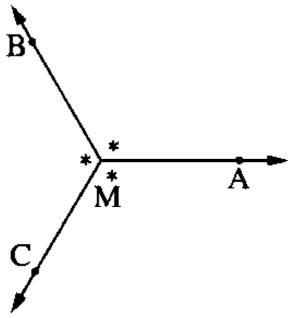
(8) m (∠ BCD) = ...°



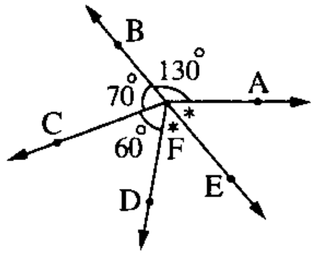
(9) m (∠ CMD) = ...°



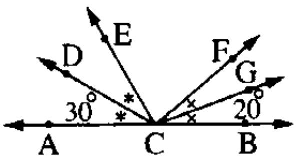
(10) m (∠ AME) = ...°



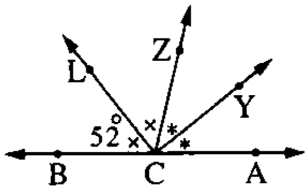
(11) m (∠ AMC) = ...°



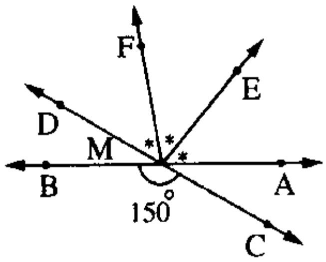
(12) m (∠ EFD) = ...°



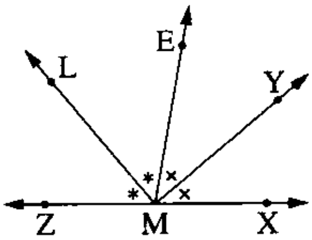
(13) m (∠ FCE) = ...°



(14) m (∠ YCA) = ...°

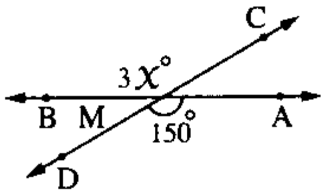
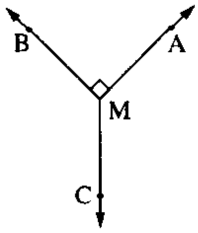
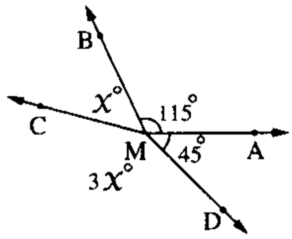


(15) m (∠ CMF) = ...°



(16) m (∠ YML) = ...°

[3] Complete:

(1)	If two straight lines intersect , then each of two vertically opposite angles are ……….
(2)	The sum of the measures of the accumulative angles at the point equals ……….°
(3)	In the opposite figure : $\overleftrightarrow{AB} \cap \overleftrightarrow{CD} = \{M\}$, then $x =$ ……….° 
(4)	In the opposite figure : $\overrightarrow{MB} \perp \overrightarrow{MA}$ and $\overrightarrow{MC}$ bisects the reflexed angle AMB , then m (∠ AMC) = ……….° 
(5)	In the opposite figure : $x =$ ……….° 

The angle bisector:

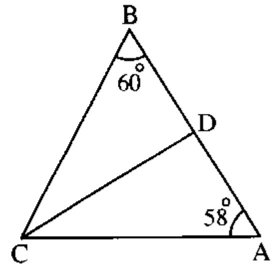
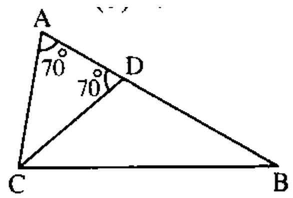
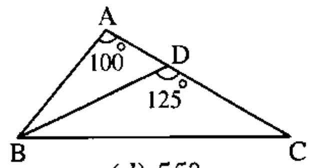
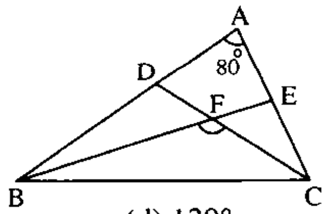
It is the ray that divides the angle into two halves.

If $\overrightarrow{BD}$ bisects ∠ ABC

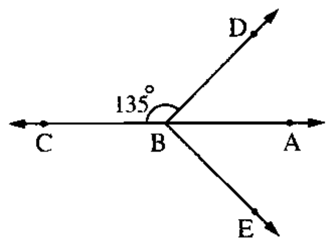
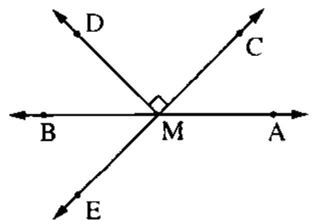
and m (∠ ABD) = 35° , then m (∠ ABC) = ……….°

[4] Choose the correct answer:

(1)	The sum of the measures of the accumulative angles at the point equals ………. angles. (a) 2 right (b) 3 right (c) 4 right (d) 5 right
(2)	The sum of measures of 4 accumulative angles at the point ………. the sum of measures of 5 accumulative angles at the point. (a) = (b) < (c) > (d) ≠

(3)	The two bisectors of two adjacent supplementary angles ……… (a) are perpendicular. (b) are parallel. (c) are coincident (d) included an acute angle between them.
(4)	**In the opposite figure :** If ABC is a triangle in which $\overrightarrow{CD}$ bisects ∠ ACB , m (∠ A) = 58°, m (∠ B) = 60° , then m (∠ ADC) = ………  (a) 62° (b) 89° (c) 91° (d) 130°
(5)	**In the opposite figure :** If $\overrightarrow{CD}$ bisects ∠ BCA , m (∠ A) = m (∠ ADC) = 70° , then m (∠ B) = ………  (a) 70° (b) 30° (c) 80° (d) 40°
(6)	**In the opposite figure :** ABC is triangle , D ∈ $\overline{AC}$ and $\overrightarrow{BD}$ is a bisector of ∠ B , what is the measure of ∠ C ?  (a) 25° (b) 30° (c) 45° (d) 55°
(7)	**In the opposite figure :** m (∠ A) = 80° , $\overrightarrow{BE}$ is the bisector of ∠ B , $\overrightarrow{CD}$ is the bisector of ∠ C what is the measure of the shown angle BFC ?  (a) 80° (b) 100° (c) 120° (d) 130°

[4] Answer the following:

(1)	**In the opposite figure:** If B ∈ $\overleftrightarrow{AC}$, m (∠ DBC) = 135° and $\overrightarrow{BA}$ bisects ∠ DBE **Find each of :** m (∠ ABD) , m (∠ DBE) , m (∠ CBE) 
(2)	**In the opposite figure:** If $\overleftrightarrow{AB} \cap \overleftrightarrow{CE} = \{M\}$, $\overrightarrow{MD} \perp \overleftrightarrow{CE}$, and $\overrightarrow{MB}$ bisects ∠ DME **Find the measures of the following angles :** ∠ BME , ∠ DME , ∠ AMC and ∠ AME 

(3) In the opposite figure:

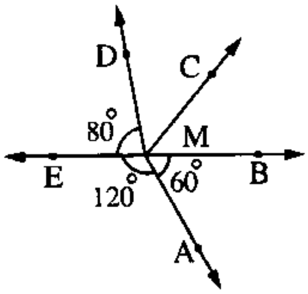
$m(\angle AMB) = 60°$, $m(\angle AME) = 120°$,

$m(\angle EMD) = 80°$

and $\overrightarrow{MC}$ bisects $\angle BMD$

Find :

(1) $m(\angle CMD)$ (2) $m(\angle AMC)$



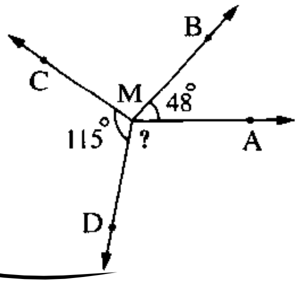
(4) In the opposite figure:

$m(\angle BMC) = 2\ m(\angle AMB)$,

$m(\angle AMB) = 48°$

and $m(\angle DMC) = 115°$

Find : $m(\angle AMD)$



Sheet (4)
Congruence

(1) Two line segments are congruent if they are equal in length. if $AB = XY$ then $\overline{AB} \equiv \overline{XY}$.

(2) Two angles are congruent if they are equal in measure. if $m(\angle A) = m(\angle B)$ then $\angle A \equiv \angle B$.

(3) Two polygons are congruent if each side and each angle in one of them are congruent to their corresponding elements in the other.

(4) Two squares are congruent of the side length of one of them is congruent to the side length of the other.

(5) Two rectangles are congruent if the dimensions of one of them are congruent to the dimensions of the other.

[1] Complete the following:

(1)	The two line segments are congruent if ....
(2)	The two angles are congruent if ....
(3)	The two polygons are congruent if there is a correspondence between their vertices such that each .... and each .... in the first polygon is congruent to its corresponding element in ....
(4)	The axis of symmetry of a polygon divides it into two .... polygons.
(5)	If $\overline{AB} \equiv \overline{CD}$, then AB = ...
(6)	If $\overline{AB} \equiv \overline{XY}$, then AB – XY = ...
(7)	If $\angle A \equiv \angle B$ and $m(\angle A) = 50°$, then $m(\angle B) =$ ....°
(8)	If $\angle A$ supplements $\angle B$ and $\angle A \equiv \angle B$, then $m(\angle B) =$ ....°
(9)	If $\angle A$ complements $\angle B$ and $\angle A \equiv \angle B$, then $m(\angle A) =$ ....°
(10)	If C is the midpoint of $\overline{AB}$, then $\overline{AC}$ .... $\overline{BC}$

(11) If the polygon ABCD ≡ the polygon XYZL , then $\overline{DA}$ ≡ ....

, m (∠ BCD) = m (∠ ....)

(12) The two squares are congruent if .... are equal in length , while the two rectangles are congruent if .... are equal.

[2] Answer the following:

(1) **In the opposite figure:**

The two pentagons shown are congruent

Complete :

(1) B corresponds to ....

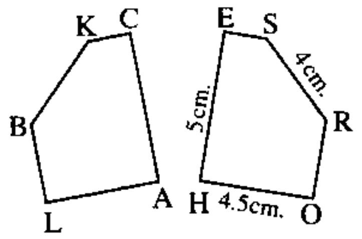
(2) The polygon BLACK is congruent to the polygon ....

(3) KB = ... cm.

(4) m (∠ E) = m (∠ ....)

(5) CA = ... cm.

(6) m (∠ A) = m (∠ ....)



(2) **In the opposite figure:**

If C ∈ $\overleftrightarrow{BD}$, m (∠ AFC) = 110° , BC = 5 cm.

and the polygon ABCF ≡ the polygon EDCF

Complete the following :

(1) AB = ...

(2) AF = ...

(3) CD = ...

(4) $\overline{CF}$ is .... side.

(5) m (∠ E) = m (∠ ....)

(6) m (∠ B) = m (∠ ....)

(7) m (∠ FCD) = m (∠ ....)

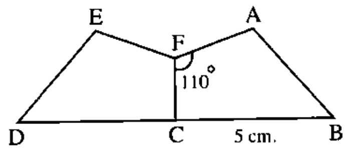
(8) m (∠ EFC) = ... °

(9) BD = ... cm.

(10) m (∠ FCD) = ... °

(11) m (∠ AFE) = ... °

(12) The axis of symmetry of the polygon ABDEF is ....



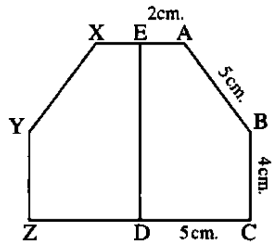
(3) **In the opposite figure:**

If : D ∈ $\overleftrightarrow{CZ}$ and the figure ABCDE ≡ the figure XYZDE ,

AE = 2 cm. , BC = 4 cm. and AB = CD = 5 cm.

Find :

The perimeter of the figure ABCZYX = ... cm.



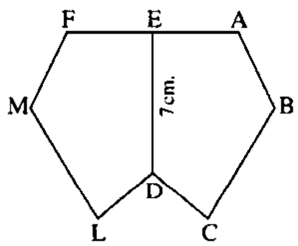
(4) **In the opposite figure:**

If : E ∈ $\overleftrightarrow{AF}$, the perimeter of the figure ABCDE = 27 cm. ,

DE = 7 cm.

and the polygon ABCDE ≡ the polygon FMLDE

Find : The perimeter of the figure ABCDLMF = ... cm.

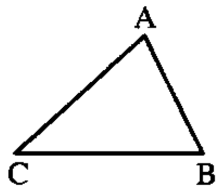


Sheet (5)
Congruent triangles

We know that any triangle has three sides and three angles which are known as the six elements of the triangle.

For example :

Δ ABC has three sides which are : $\overline{AB}$, $\overline{BC}$ and $\overline{AC}$ and it has three angles which are : $\angle A$, $\angle B$ and $\angle C$



Therefore :

The two triangles are congruent if each element of the 6 elements of one of them is congruent to the corresponding element in the other triangle and vice versa.

- To test whether two triangles are congruent or not, you don't need to test all the three sides and the three angles.

The cases of congruence of two triangles

In the following, we will show the cases of congruence of two triangles. We will find that it is not necessary to prove congruence of the six elements of one of them to the corresponding elements of the other. But it is enough to prove congruence of three elements of the first to the corresponding elements of the other, one of them at least is a side, then the remained three elements in one of them are congruent to their corresponding elements in the other.

Cases of congruence of two triangles

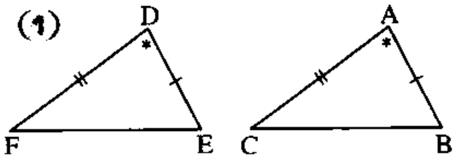
Case (1)	Case (2)	Case (3)	Case (4)
Two sides and the included angle	Two angles and one side	Three sides	Hypotenuse and one side in the right-angled triangle
S. A. S.	A. S. A.	S. S. S.	R. H. S.
Two triangles are congruent if two sides and the included angle of one triangle are congruent to the corresponding parts of the other triangle	Two triangles are congruent if two angles and the side drawn between their vertices of one triangle are congruent to the corresponding parts of the other triangle	Two triangles are congruent if each side of one triangle is congruent to the corresponding side of the other triangle	Two right-angled triangles are congruent if the hypotenuse and a side of one triangle are congruent to the corresponding parts of the other triangle

Remark

If each angle of one triangle is congruent to the corresponding angle of the other triangle , it is not necessary for the two triangles to be congruent.

[1] In each of the following figures, show if the two triangles are congruent or not. If they are congruent, name the case of congruence. If they aren't congruent, give reason. (given that the similar signs denoted the congruency of the elements marked by these signs).

(1)



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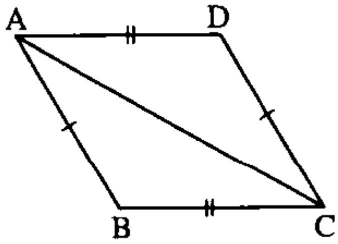

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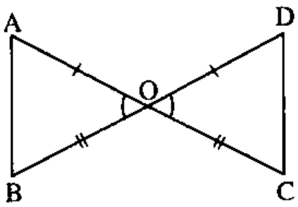

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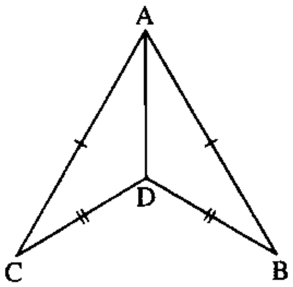

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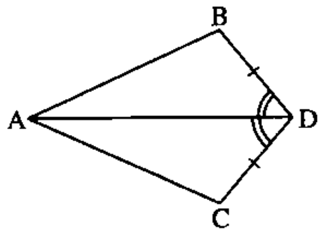

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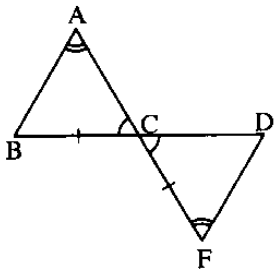

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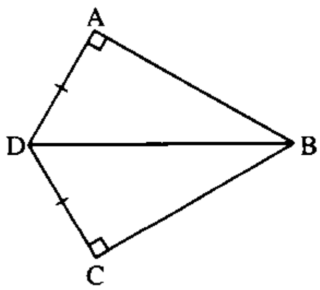

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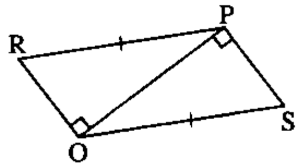

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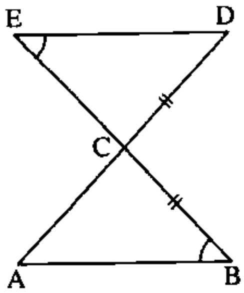

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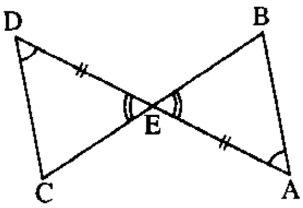

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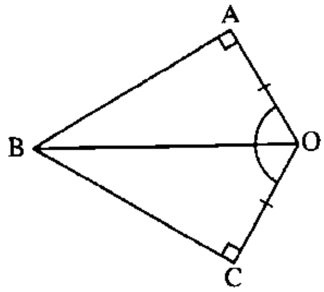

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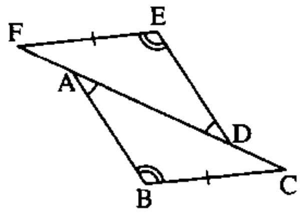

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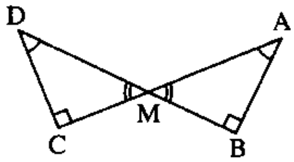

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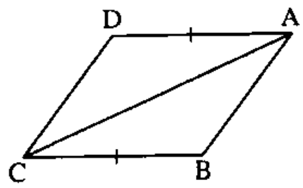

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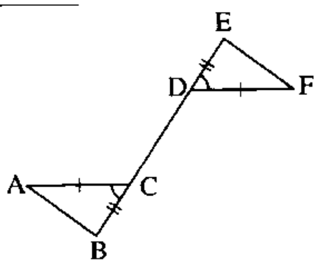

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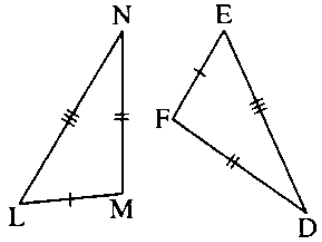

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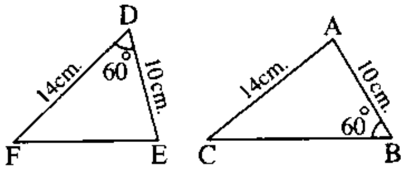

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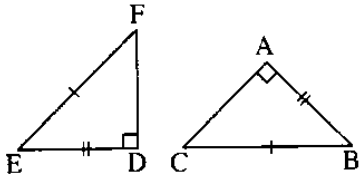

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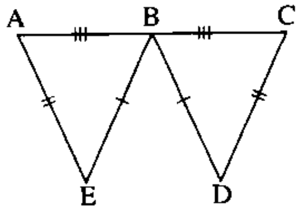

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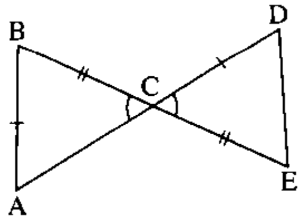

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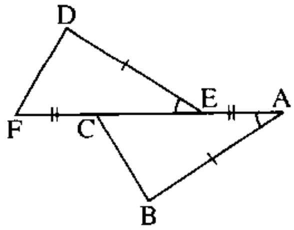

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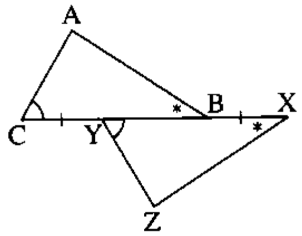

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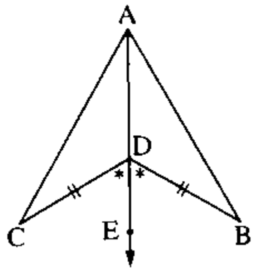

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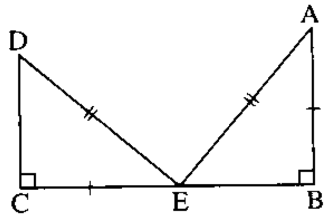

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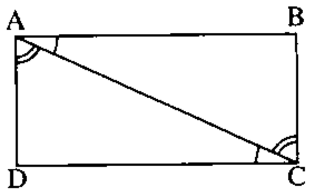

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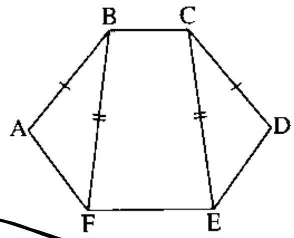
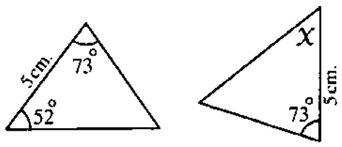


[2] Answer the following:

(1) **In the opposite figure:**

These triangles are congruent

, then $x =$ ....°



(2) **In the opposite figure:**

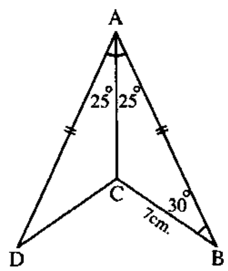
If : AB = AD , BC = 7 cm. , m (∠ BAC) = m (∠ DAC) = 25°

and m (∠ B) = 30°

Complete the following :

(1) Δ ACB ≡ Δ .... (2) m (∠ D) = ...°

(3) CD = ... cm. (4) m (∠ ACD) = ...°

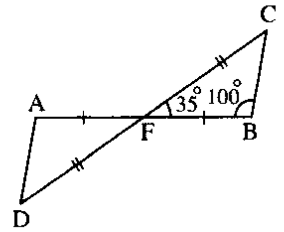


(3) **In the opposite figure:**

If : $\overline{CD} \cap \overline{BA} = \{F\}$, FA = FB , CF = FD ,

m (∠ CFB) = 35° and m (∠ B) = 100° ,

then m (∠ D) = ...°



(4) **In the opposite figure:**

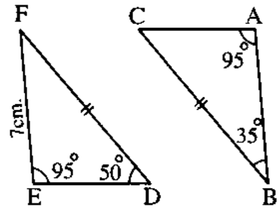
If : BC = FD , m (∠ A) = m (∠ E) = 95° ,

m (∠ B) = 35° , m (∠ D) = 50° and FE = 7 cm.

Complete the following :

(1) m (∠ C) = ...° (2) m (∠ F) = ...° (3) Δ ABC ≡ ....

(4) $\overline{AC}$ ≡ .... (5) AB = ... cm.



(5) **In the opposite figure:**

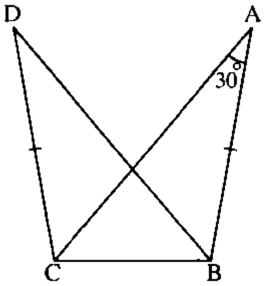
If : AB = DC , AC = DB and m (∠ A) = 30°

Complete the following :

(1) Δ ABC ≡ Δ ....

(2) m (∠ D) = ...°

(3) m (∠ DBC) = m (∠ ....)



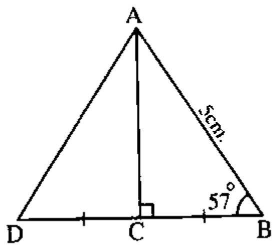
(6) **In the opposite figure:**

C is the midpoint of $\overline{BD}$, $\overline{AC} \perp \overline{BD}$,

AB = 5 cm. and m (∠ B) = 57°

Find : (1) The length of $\overline{AD}$

(2) m (∠ DAC)

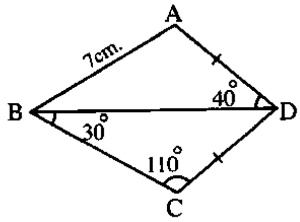


(7) **In the opposite figure:**

AD = DC , m (∠ ADB) = 40° , m (∠ DBC) = 30° ,

m (∠ BCD) = 110° and AB = 7 cm.

Find : (1) The length of $\overline{BC}$ (2) m (∠ BAD)



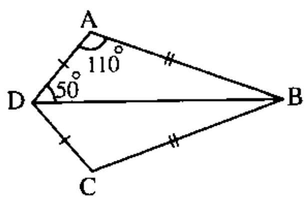
(8) **In the opposite figure:**

BA = BC , DA = DC ,

m (∠ ADB) = 50° and

m (∠ BAD) = 110°

Find : m (∠ ABC)

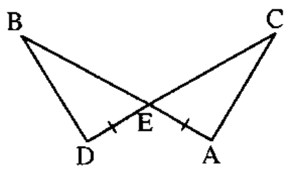


(9) **In the opposite figure:**

$\overline{AB} \cap \overline{CD} = \{E\}$, AE = ED and ∠ A ≡ ∠ D

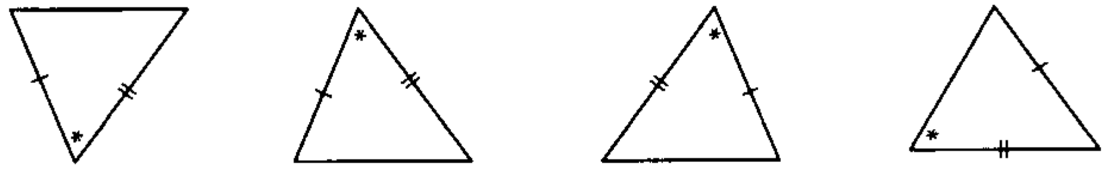
Is Δ ACE ≡ Δ DBE ? Why ?

Prove that : CE = EB



[3] Choose the correct answer:

(1) The following triangles are congruent except ·········

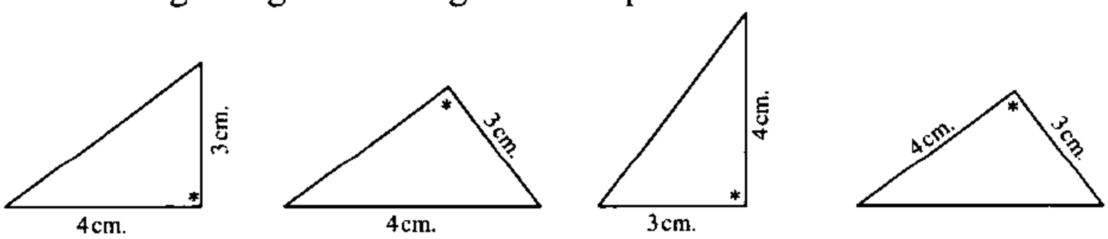


(a) (b) (c) (d)

(2) The following triangles are congruent except ·········

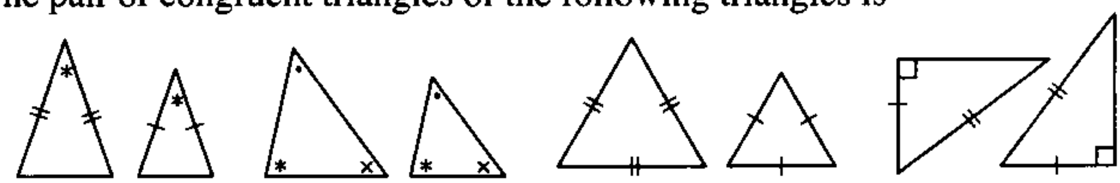
(a) (b) (c) (d)

(3) The following triangles are congruent except ·········



(a) (b) (c) (d)

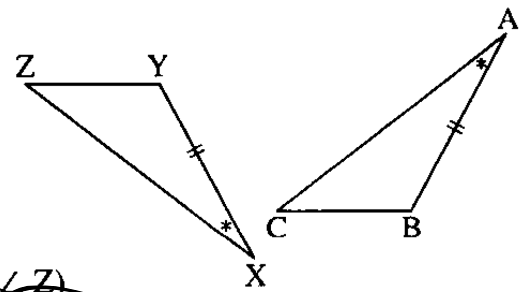
(4) The pair of congruent triangles of the following triangles is ·········



(a) (b) (c) (d)

(5) **In the opposite figure :**

The necessary and enough condition which makes the two triangles ABC and XYZ be congruent is ·········



(a) BC = YZ (b) AC = XZ

(c) m (∠ C) = m (∠ Z) (d) m (∠ B) = m (∠ Z)

[4] Complete the following:

(1) If : $\Delta ABC \equiv \Delta XYZ$, m ($\angle$ A) = 50° and m ($\angle$ B) = 60° , then : m ($\angle$ Z) = ...°

(2) If : $\Delta ABC \equiv \Delta LMN$, m ($\angle$ L) = 40° and m ($\angle$ B) = 90° , then : m ($\angle$ C) = ...°

(3) If : $\Delta ABC \equiv \Delta XYZ$ and m ($\angle$ A) + m ($\angle$ B) = 120° , then : m ($\angle$ Z) = ...°

(4) If : $\Delta ABC \equiv \Delta DEF$ and m ($\angle$ C) = 90° , then : m ($\angle$ D) + m ($\angle$ E) = ...°

(5) If : $\Delta ABC \equiv \Delta XYZ$, the perimeter of ΔABC = 12 cm. , XY = 4 cm. and YZ = 5 cm. , then : AC = ...

(6) Any two triangles are congruent if each .... is congruent to its corresponding side in the other triangle.

(7) Any two triangles are congruent if two angles and .... in one of the triangles are congruent to their corresponding elements in the other.

(8) The diagonal of the rectangle divides its surface into two .... triangles.

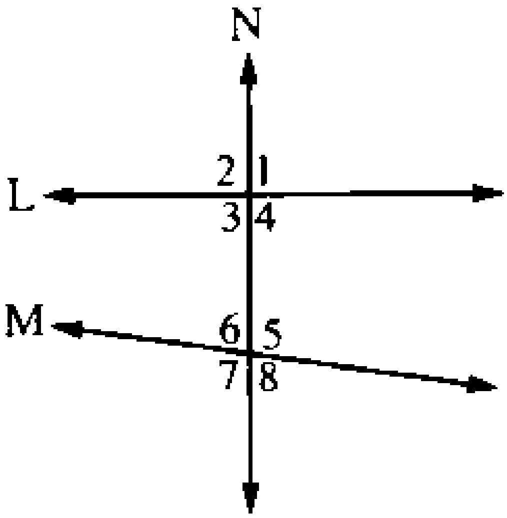
(9) If $\Delta ABC \equiv \Delta XYZ$, then AB = ... and m ($\angle$ Z) = m ($\angle$ ....)

(10) If : AB = LM , BC = MN and m ($\angle$ B) = m ($\angle$ M) , then the two triangles .... and .... will be congruent.

Sheet (6)
Parallelism

Angles Formed from two straight lines and a transversal:

If a straight line N cuts two straight lines L and M as shown in the opposite figure, then we get eight angles.

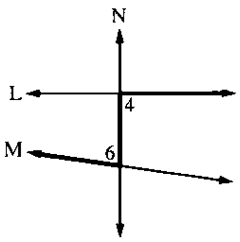


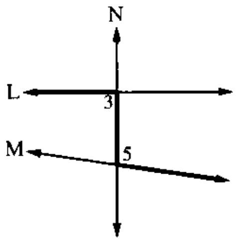
We can classify these angles into pairs of angles:

- Alternate angles.
- Corresponding angles.
- Interior angles on the same side of the transversal.

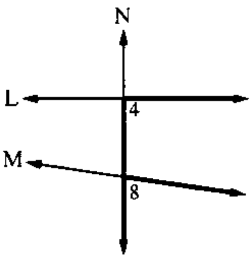
As follows

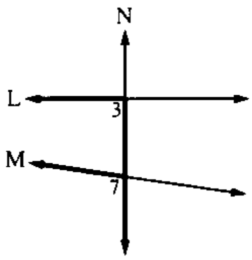
(1) Pairs of alternate angles:

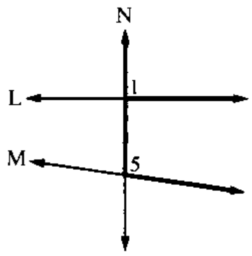


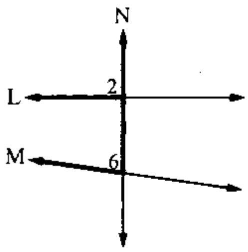


(2) Pairs of corresponding angles:

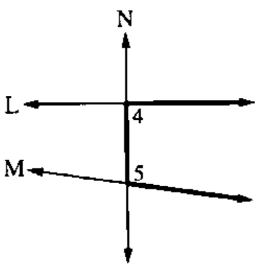


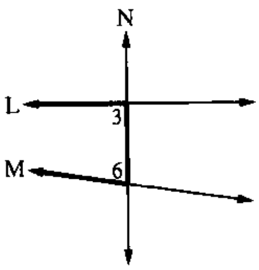






(3) Pairs of interior angles on the same side of the transversal





Relation between pairs of angles formed from two parallel straight lines and a transversal to them

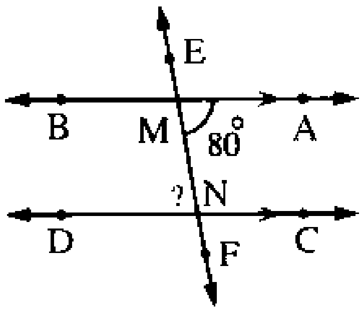
If a straight line intersects two parallel lines, then:

(1) Each two alternate angles are equal in measure.

(2) Each two corresponding angles are equal in measure.

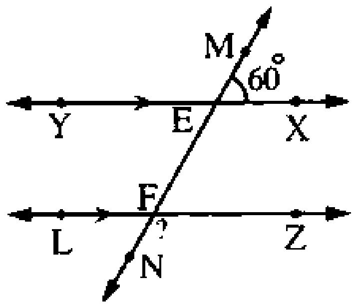
(3) Each two interior angles in the same side of the transversal are supplementary.

In each of the following figures, find the measure of the angle which is marked by (?) giving reason:



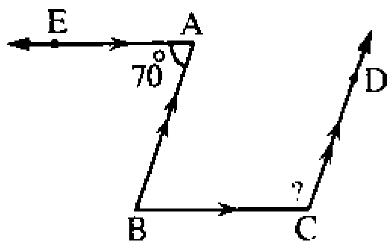
(1)

………………………………………
………………………………………



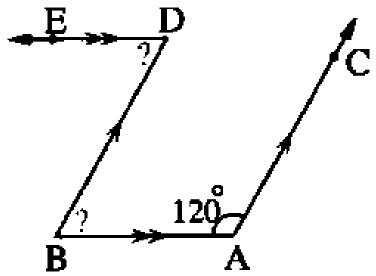
(2)

………………………………………
………………………………………



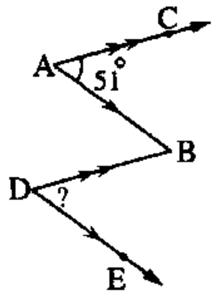
(3)

………………………………………
………………………………………



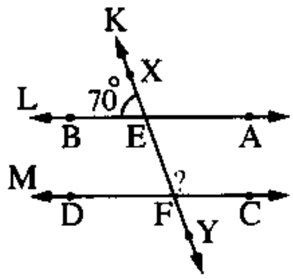
(4)

………………………………………
………………………………………



(5)

………………………………………
………………………………………



(6)

………………………………………
………………………………………

The condition of parallelism of two straight lines

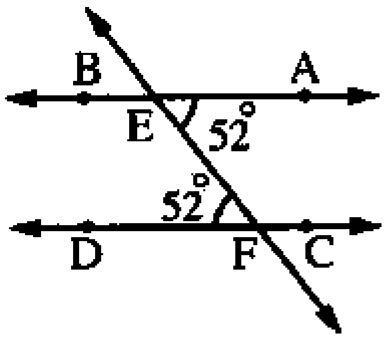
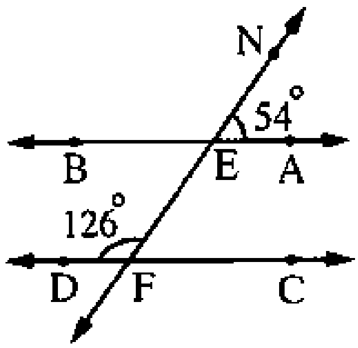
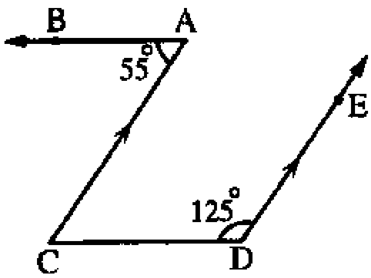
The two straight lines are parallel if a third straight line intersects them (as a transversal) and one of the following cases satisfied:

(1) Two alternate angles have the same measure.

(2) Two corresponding angles have the same measure.

(3) Two interior angles in the same side of the transversal are supplementary.

In each of the following figures, why is $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$?

 (1) …………………………………… …………………………………… ……………………………………	 (2) …………………………………… …………………………………… ……………………………………	 (3) …………………………………… …………………………………… ……………………………………

Geometric facts

(1) The perpendicular to one of two parallel straight lines is perpendicular to the other.

(2) If two straight lines are perpendicular to a third one, then the two straight lines are parallel.

(3) If two straight lines are parallel to a third one, then the two straight lines are parallel.

(4) If parallel straight lines divide a straight line into segments of equal lengths, then they divide any other line into segments of equal lengths.

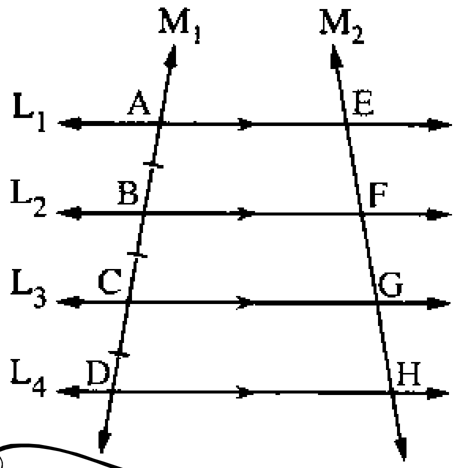
If $L_1 // L_2 // L_3 // L_4$,

and M_1 and M_2 are two transversal in which:

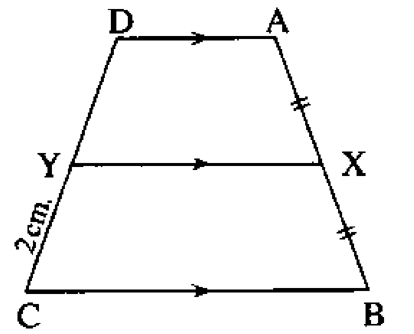
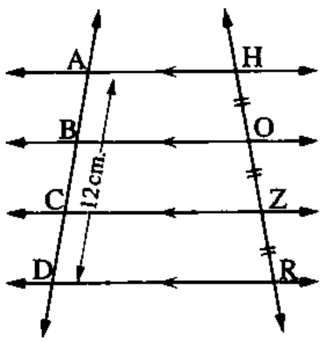
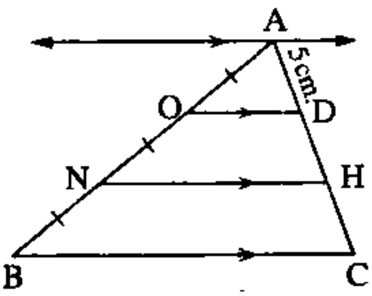
AB = BC = CD,

then:

EF = FG = GH



Complete using the given shown in the following figures:

 DY = …………… cm	 AC = ………… cm	 AC = ………… cm

[1] Choose the correct answer:

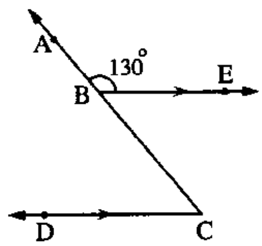
(1) In the opposite figure:

$B \in \overline{AC}$, $\overrightarrow{BE} // \overrightarrow{CD}$ and m (∠ ABE) = 130°

Then m (∠ C) = ………

(a) 130° (b) 40°

(c) 50° (d) 90°



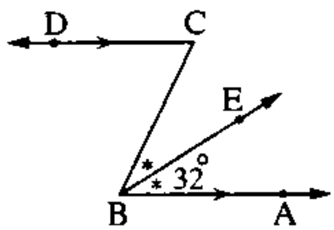
(2) In the opposite figure:

$\overrightarrow{BE}$ bisects ∠ ABC , $\overrightarrow{BA} // \overrightarrow{CD}$ and

m (∠ ABE) = 32° , then m (∠ C) = ………

(a) 32° (b) 64°

(c) 60° (d) 80°



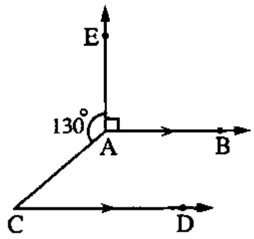
(3) **In the opposite figure:**

$\overrightarrow{AB} \parallel \overrightarrow{CD}$, m ($\angle$ EAC) = 130°

and m ($\angle$ EAB) = 90° , then m ($\angle$ C) = ……….

(a) 90° (b) 130°

(c) 140° (d) 40°



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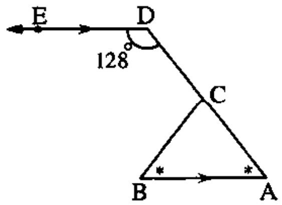
(4) **In the opposite figure:**

$\overrightarrow{AB} \parallel \overrightarrow{DE}$, m ($\angle$ D) = 128°,

m ($\angle$ A) = m ($\angle$ B) and C $\in \overline{AD}$, then m ($\angle$ B) = ……….

(a) 64° (b) 128°

(c) 52° (d) 26°



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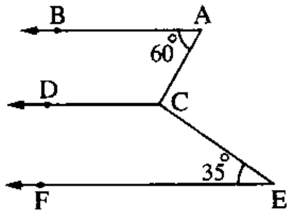
(5) **In the opposite figure:**

$\overrightarrow{AB} \parallel \overrightarrow{CD}$, $\overrightarrow{AB} \parallel \overrightarrow{EF}$, m ($\angle$ A) = 60° and

m ($\angle$ E) = 35° , then m ($\angle$ ACE) = ……….

(a) 60° (b) 35°

(c) 95° (d) 85°



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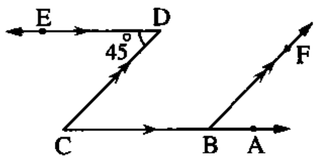
(6) **In the opposite figure:**

m ($\angle$ D) = 45° , $\overrightarrow{DE} \parallel \overrightarrow{CA}$ and

$\overrightarrow{CD} \parallel \overrightarrow{BF}$, then m ($\angle$ ABF) = ……….

(a) 45° (b) 90°

(c) 135° (d) 40°



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(7) **In the opposite figure:**

$\overline{AX} \parallel \overline{BY} \parallel \overline{CE} \parallel \overline{DF}$,

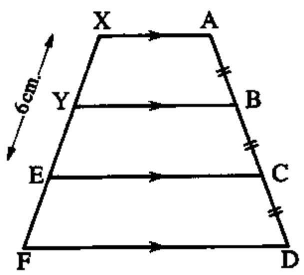
AB = BC = CD

and XE = 6 cm.

, then the length of $\overline{YF}$ = ……….

(a) 3 cm. (b) 6 cm.

(c) 12 cm. (d) 9 cm.



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(8) **In the opposite figure:**

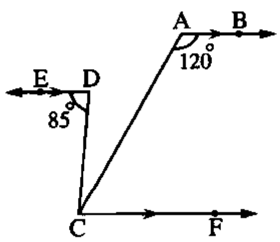
$\overrightarrow{AB} \parallel \overrightarrow{CF} \parallel \overrightarrow{DE}$,

m ($\angle$ A) = 120° and m ($\angle$ D) = 85° ,

then m ($\angle$ ACD) = ……….

(a) 60° (b) 85°

(c) 25° (d) 120°

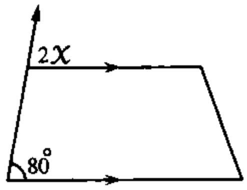


(9) In the opposite figure:

What is the value of x ?

(a) 40° (b) 60°

(c) 80° (d) 100°



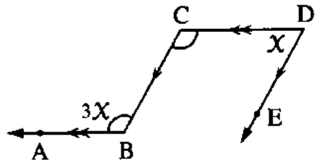
(10) In the opposite figure:

$\overline{CD} // \overrightarrow{BA}$, $\overrightarrow{DE} // \overline{CB}$

, then : $x =$ ………

(a) 60° (b) 45°

(c) 120° (d) 90°



[2] Complete:

(1) 📖 The straight line which is perpendicular to one of two parallel straight lines is ……… to the other straight line in the plane.

(2) 📖 If two straight lines are parallel to a third straight line , then they are ………

(3) If a straight line cuts two parallel straight lines , then each two alternate angles are ………

(4) If a straight line cuts two parallel straight lines , then each two corresponding angles are ………

(5) If a straight line cuts two parallel straight lines , then each two interior angles in the same side of the transversal are ………

(6) If a straight line cuts two straight lines and there are two corresponding angles having the same measure , then the two straight lines are ………

(7) If a straight line cuts two straight lines and there are two alternate angles having the same measure , then the two straight lines are ………

(8) If a straight line cuts two straight lines and there are two interior angles in the same side of the transversal are supplementary , then the two straight lines are ………

(9) If a straight line cuts several parallel lines and the intercepted parts of this transversal between these parallel straight lines are equal in length , then the intercepted parts for any transversal are ………

[3] Answer the following:

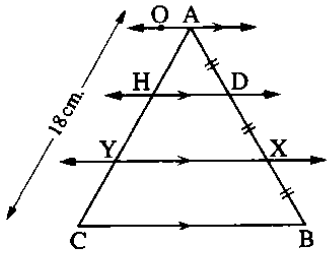
(1) In the opposite figure:

$\overleftrightarrow{AO} \parallel \overleftrightarrow{HD} \parallel \overleftrightarrow{YX} \parallel \overline{CB}$

$, AD = DX = XB$

and AC = 18 cm.

Find the length of $\overline{AY}$

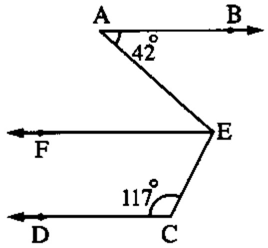


(2) In the opposite figure:

$\overrightarrow{AB} \parallel \overrightarrow{CD}$, $\overrightarrow{EF} \parallel \overrightarrow{CD}$

, m (∠ A) = 42° and m (∠ C) = 117°

Determine : m (∠ AEC)

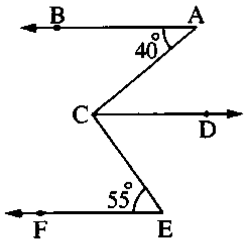


(3) In the opposite figure:

m (∠ A) = 40° , m (∠ E) = 55°

$\overrightarrow{AB} \parallel \overrightarrow{EF}$ and $\overrightarrow{AB} \parallel \overrightarrow{CD}$

Find : m (∠ ACE)

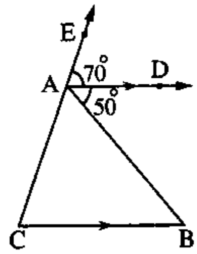


(4) In the opposite figure:

$\overrightarrow{AD} \parallel \overline{BC}$, $E \in \overrightarrow{CA}$,

m (∠ DAE) = 70° and m (∠ DAB) = 50°

Find the measures of the triangle ABC

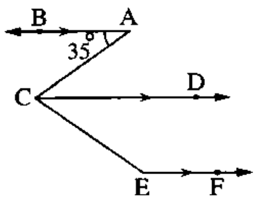


(5) In the opposite figure:

$\overrightarrow{AB} \parallel \overrightarrow{CD} \parallel \overrightarrow{EF}$, m (∠ A) = 35° and

$\overrightarrow{CD}$ bisects ∠ ACE

Find : (1) m (∠ DCE) (2) m (∠ CEF)

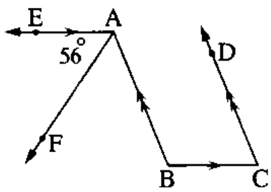


(6) In the opposite figure:

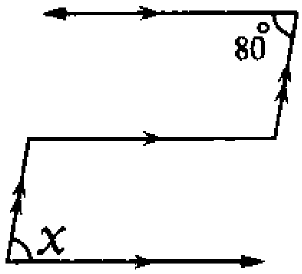
$\overrightarrow{AE} \parallel \overrightarrow{CB}$, $\overrightarrow{BA} \parallel \overrightarrow{CD}$,

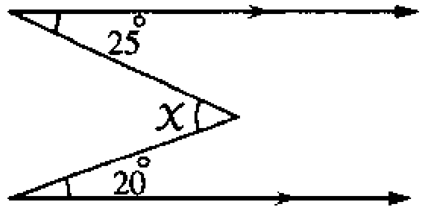
$\overrightarrow{AF}$ bisects ∠ BAE and m (∠ EAF) = 56°

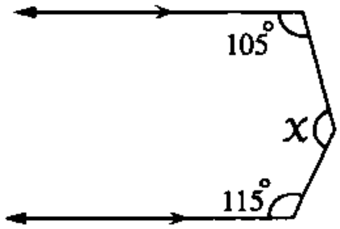
Find : m (∠ C)

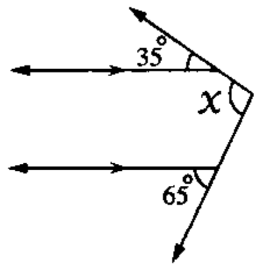


[4] Find the value of x:









Sheet (7)

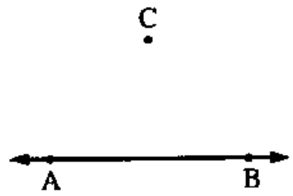
Geometric constructions

First: Constructing a perpendicular from a point outside a straight line:

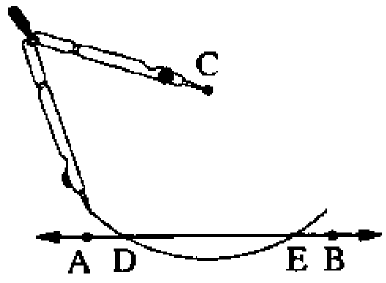
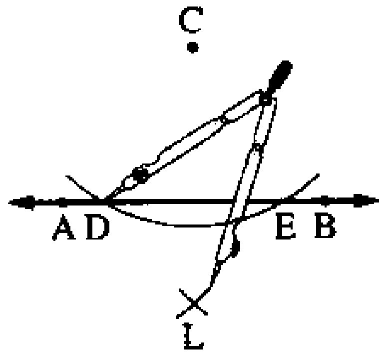
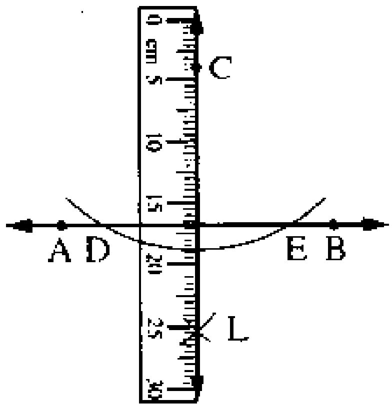
If $\overleftrightarrow{AB}$ is a given straight line , $C \notin \overleftrightarrow{AB}$

as shown in fig. (1)

The required is constructing the perpendicular to $\overleftrightarrow{AB}$ from C



Steps:

		
Step (1)	Step (2)	Step (3)

Second: Constructing a perpendicular from a point on a straight line:

If : $\overleftrightarrow{AB}$ is a given straight line.

$C \in \overleftrightarrow{AB}$ as shown in fig. (1)

The required is drawing a perpendicular to $\overleftrightarrow{AB}$ from the point C

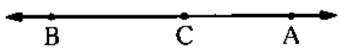
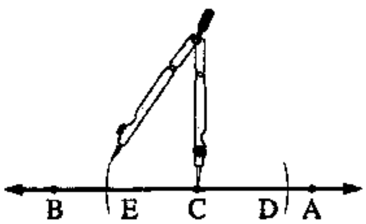
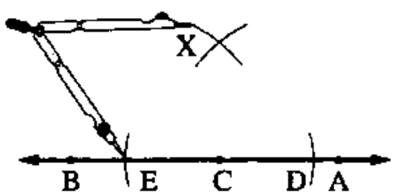
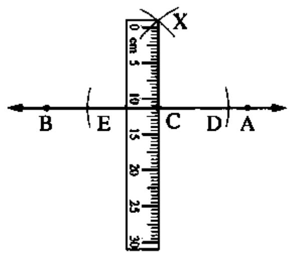


Fig. (1)

Steps:

		
Step (1)	Step (2)	Step (3)

The axis of symmetry of a line segment

It is the straight line perpendicular to it from its midpoint.

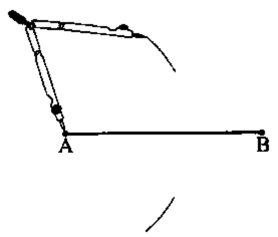
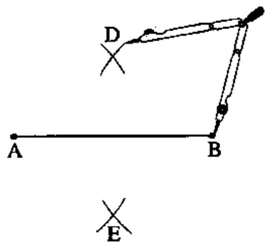
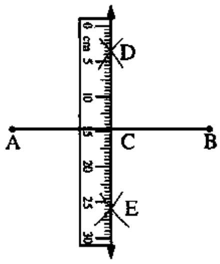
Third: Bisecting a given line segment:

If $\overline{AB}$ is a given line segment as shown in fig. (1)

The required is constructing the symmetry axis of the line segment $\overline{AB}$ (The perpendicular to $\overline{AB}$ from its midpoint).

Fig. (1)

Steps:

		
Step (1)	Step (2)	Step (3)

Fourth: Bisecting a given angle:

If ∠ ABC is a given angle as shown in fig. (1)

The required is constructing the bisector of ∠ ABC

"Using the compasses and the ruler"

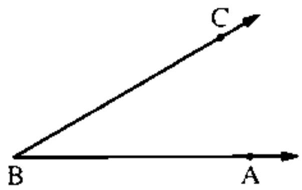
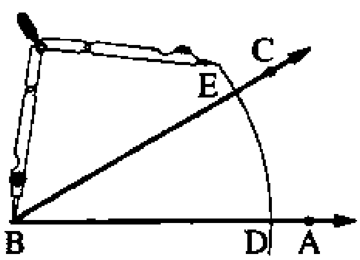
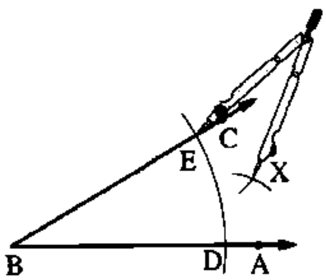
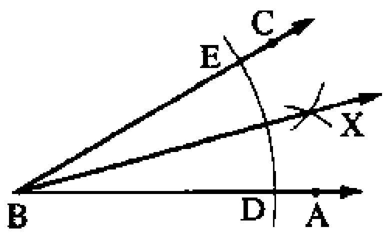


Fig. (1)

Steps:

		
Step (1)	Step (2)	Step (3)

Fifth: Constructing an angle to be congruent to a given angle:

$\angle ABC$ is a given angle as shown in fig. (1)

The required is drawing $\angle XYZ$ such that $\angle XYZ$ is congruent to $\angle ABC$

i.e.: $m(\angle XYZ) = m(\angle ABC)$

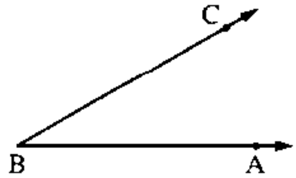
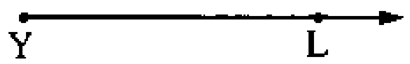
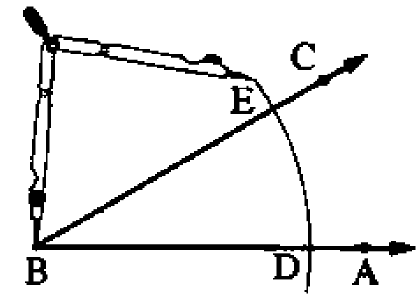


Fig. (1)

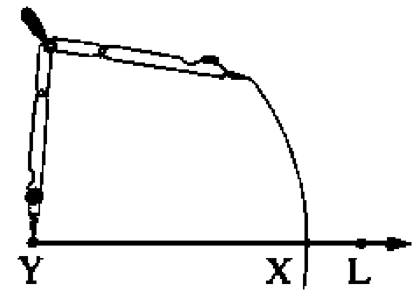
Steps:



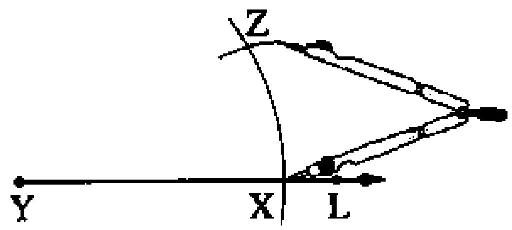
Step (1)



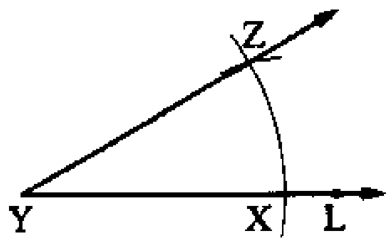
Step (2)



Step (3)



Step (4)



Step (5)

📖 Using the ruler and the compasses, draw ΔABC in which $AB = AC = 5$ cm. , $BC = 6$ cm. , then draw $\overline{AD} \perp \overline{BC}$ where $\overline{AD} \cap \overline{BC} = \{D\}$

Then find by measuring the length of $\overline{AD}$ (Don't remove the arcs)

Sixth: Drawing a straight line from a given point parallel to given straight line:

$\overleftrightarrow{AB}$ is a given straight line and $C \notin \overleftrightarrow{AB}$ as shown in fig. (1)

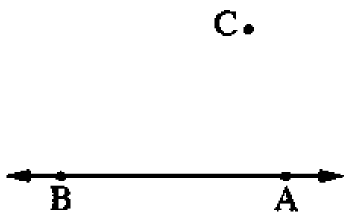
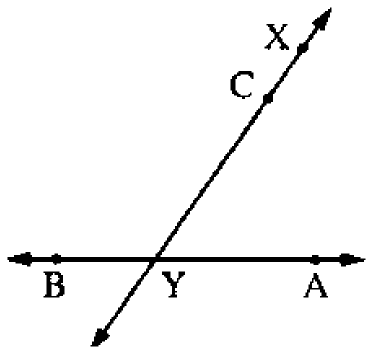
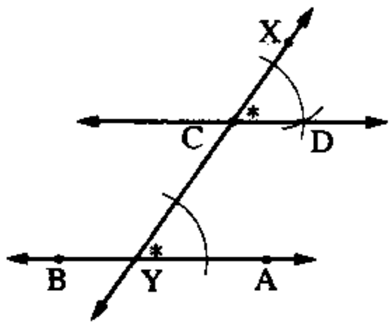


Fig. (1)

Required: The drawing a straight line passing through the point C parallel to $\overleftrightarrow{AB}$

Steps:

	
Step (1)	Step (2)

Using the ruler and the compasses , draw the line segment $\overline{BC}$ with length 7 cm. , then draw the straight line L as an axis of symmetry of it. (Don't remove the arcs)

Draw an angle whose vertex is A and its measure is 130° , use a ruler and a compasses to divide the angle A into 4 equal angles in measure. (Don't remove the arcs)

Using the geometric instruments , draw an angle of measure 120° and bisect it (Don't remove the arcs).

Using the geometric tools , draw an angle of measure 75° and bisect it (Don't remove the arcs).

Unit [4] : Geometry And Measurement

Lesson [1] : Geometric Concepts – The Relations Between Angles

1 The line segment

It is a set of points consisting of two distinct points and all points between them when we join them by a ruler.

2 The straight line

If we extend the line segment in both directions infinitely , we will get a straight line.

3 The ray

It is a line segment extended from only one of its terminals without limit.

Remarks

- Each of line segment , straight line and ray is an infinite set of points.
- $\overline{AB} \subset \overrightarrow{AB}$, $\overrightarrow{AB} \subset \overleftrightarrow{AB}$ **i.e.** $\overline{AB} \subset \overrightarrow{AB} \subset \overleftrightarrow{AB}$

4 The plane

A plane is a flat and unbounded surface , and it is extended without limit in all directions

5 The angle

It is the union of two rays with the same starting point , and this point is called the vertex of the angle , and the two rays are called the two sides of the angle.

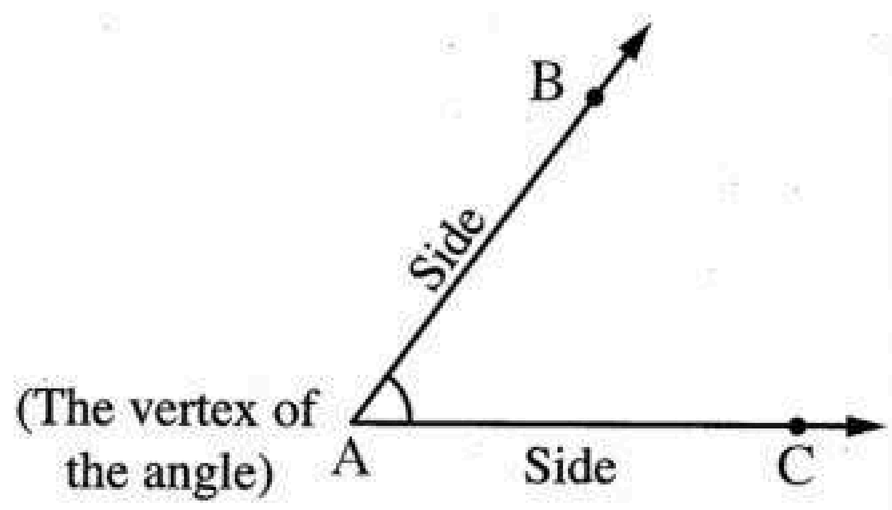
For example :

In the opposite figure :

$\overrightarrow{AB}$ and $\overrightarrow{AC}$ are two rays having the same starting point A , then :

$\overrightarrow{AB} \cup \overrightarrow{AC}$ = the angle CAB

* A is the vertex of the angle CAB



Measurement of the anlge

- A degree is divided into parts smaller than it , and they are minute (′) and second (″) where the degree equals 60 minutes and the minute equals 60 second and we can change the units of measuring angle by using the calculator.

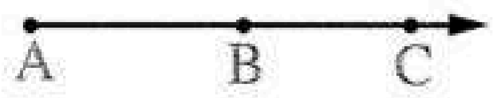
For example :

$23\frac{1}{2}^{\circ} = 23^{\circ}\ 30'$, $65\frac{1}{4}^{\circ} = 65^{\circ}\ 15'$, $81\frac{1}{8}^{\circ} = 81^{\circ}\ 7'\ 30''$

The types of angles

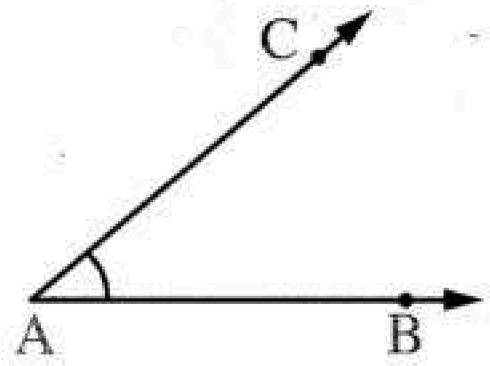
The angles are classified according to their measures as follows :

1 Zero angle



Its measure = 0 °
Its sides are coincident.

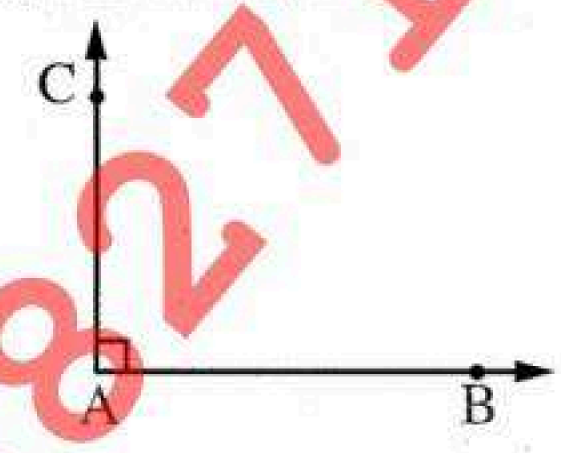
2 Acute angle



Its measure is more than 0° and less than 90°

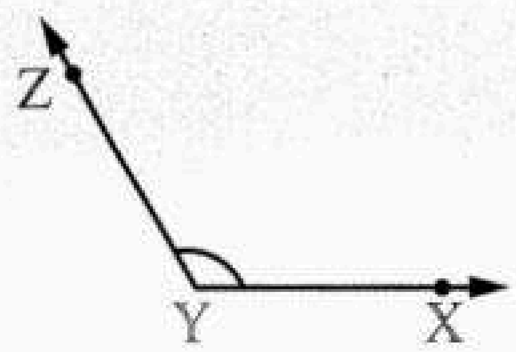
i.e. $0° <$ measure of acute angle $< 90°$

3 Right angle



Its measure = 90°

4 Obtuse angle

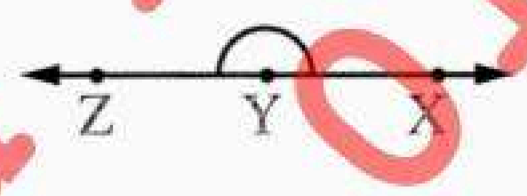


Its measure is more than 90° and less than 180°

i.e.

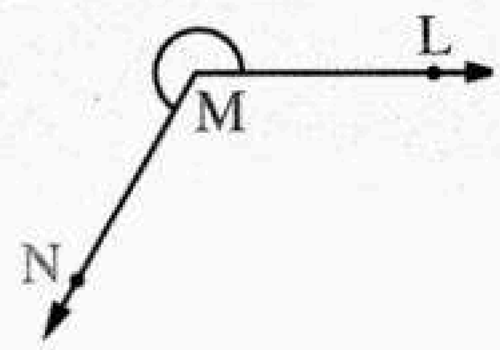
$90° <$ measure of obtuse angle $< 180°$

5 Straight angle



Its measure = 180°
Its sides are forming one straight line.

6 Reflex angle



Its measure is more than 180° and less than 360°

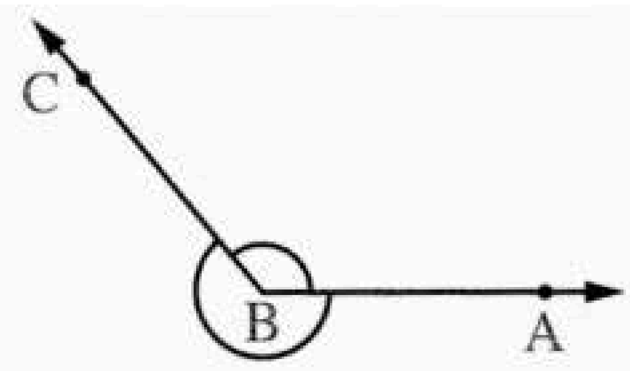
i.e.

$180° <$ measure of reflex angle $< 360°$

Remark : -

- **In the opposite figure :**

  m (∠ ABC) + m (reflex ∠ ABC) = 360°

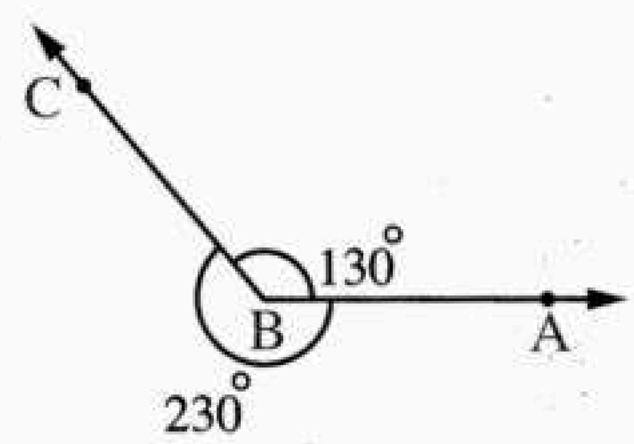


For example :

If m (∠ ABC) = 130°

, then m (reflex ∠ ABC)

= 360° – 130° = 230°



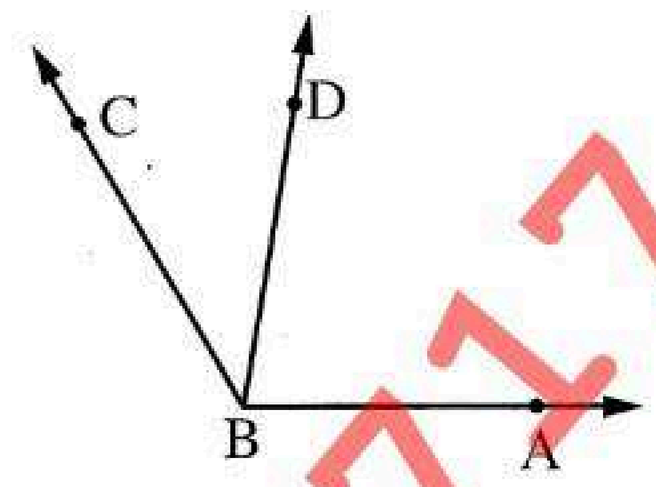
Some relations between the angles

Adjacent angles

Two angles are said to be adjacent if they have a common vertex and a common side and the other two sides are on opposite sides of this common side.

For example :

• In the opposite figure :



$\angle$ ABD and $\angle$ DBC are two adjacent angles , for :

- They have a common vertex B and a common side $\overrightarrow{BD}$
- The two other sides $\overrightarrow{BA}$ and $\overrightarrow{BC}$ are on two opposite sides of $\overrightarrow{BD}$

Complementary angles

Two angles are said to be complementary if the sum of their measures is 90°

For example :

The two angles whose measures are 55° and 35° are called two complementary angles because 55° + 35° = 90°

Remarks

1. The two complementary angles are either acute angles or one of them is zero angle and the other is a right angle.
2. The complements of the same angle (or the equal angles in measure) are equal in measure.

   i.e. If $\angle$ A complements $\angle$ B , $\angle$ C complements $\angle$ B , then m ($\angle$ A) = m ($\angle$ C)

Supplementary angles

Two angles are said to be supplementary if the sum of their measures is 180°

For example :

The two angles whose measures are 143° and 37° are called two supplementary angles because 143° + 37° = 180°

Remarks

1. The two supplementary angles are either one of them is obtuse and the other is acute or each of them is a right angle or one of them is zero angle and the other is a straight angle.
2. The supplements of the same angle (or the equal angles in measure) are equal in measure.

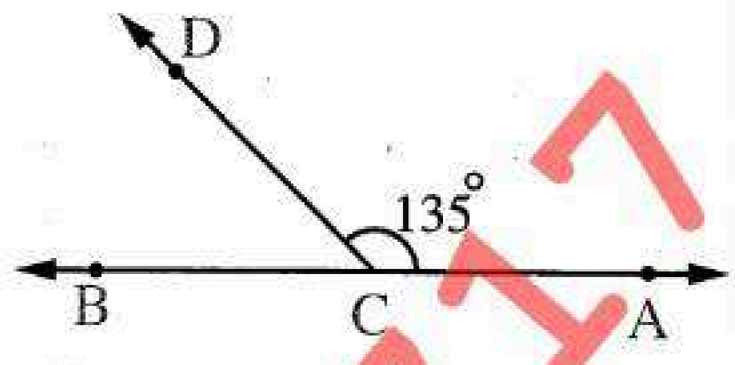
   i.e. If $\angle$ A supplements $\angle$ B and $\angle$ C supplements $\angle$ B , then m ($\angle$ A) = m ($\angle$ C)

The two adjacent supplementary angles

Two adjacent angles formed by a straight line and a ray with a starting point on this straight line , are supplementary.

i.e. In the opposite figure :

If $\overleftrightarrow{AB} \cap \overleftrightarrow{CD} = \{C\}$



Therefore , m (∠ ACD) + m (∠ DCB) = 180° "Straight angle"

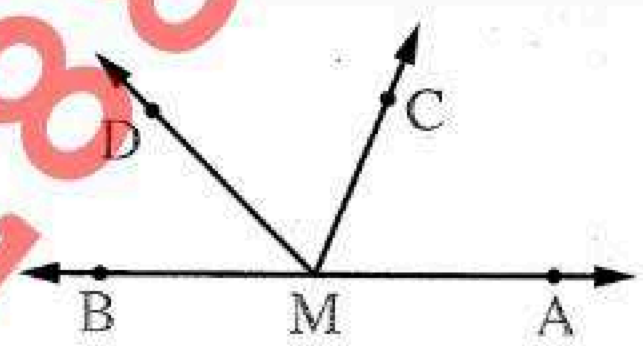
And if m (∠ ACD) = 135°

Then m (∠ DCB) = 180° – 135° = 45°

Remark : -

If $M \in \overleftrightarrow{AB}$, and $\overrightarrow{MC}$ and $\overrightarrow{MD}$ are drawn on one side of $\overleftrightarrow{AB}$,

then m (∠ AMC) + m (∠ CMD) + m (∠ DMB) = 180°



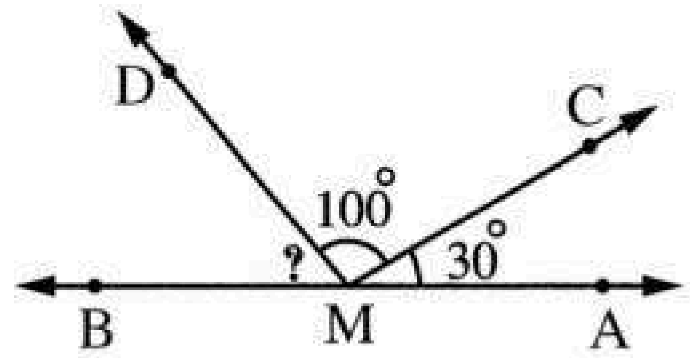
For example :

- **In the opposite figure :**

If $M \in \overleftrightarrow{AB}$, m (∠ AMC) = 30°

, m (∠ CMD) = 100°

, then : m (∠ DMB) = 180° – (30° + 100°) = 180° – 130° = 50°



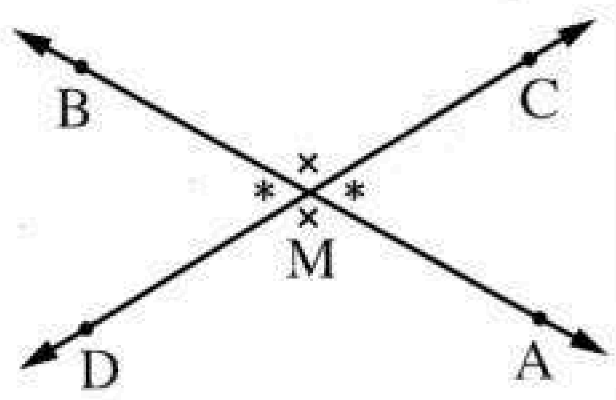
Vertically opposite angles (V.O.A.)

If two straight lines intersect , then the measures of each two vertically opposite angles are equal.

- **In the opposite figure :**

If $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ intersect at M

Then :



- ∠ AMC and ∠ BMD are vertically opposite angles ,
  , then m (∠ AMC) = m (∠ BMD)
- Also , ∠ CMB and ∠ AMD are vertically opposite angles ,
  , then m (∠ CMB) = m (∠ AMD)

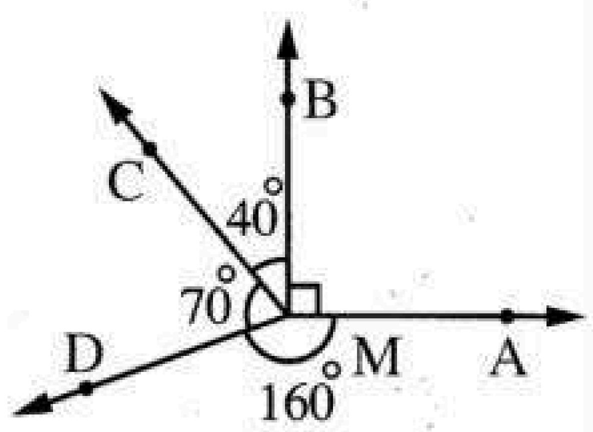
Accumulative angles at a point

The sum of the measures of the accumulative angles at a point is 360°

- **In the opposite figure :**

$\overrightarrow{MA}$, $\overrightarrow{MB}$, $\overrightarrow{MC}$ and $\overrightarrow{MD}$ are rays having the same starting point M

The angles ∠ AMB , ∠ BMC , ∠ CMD and ∠ DMA are called accumulative angles at the point M , hence we get :



m (∠ AMB) + m (∠ BMC) + m (∠ CMD) + m (∠ DMA) = 90° + 40° + 70° + 160° = 360°

The angle bisector

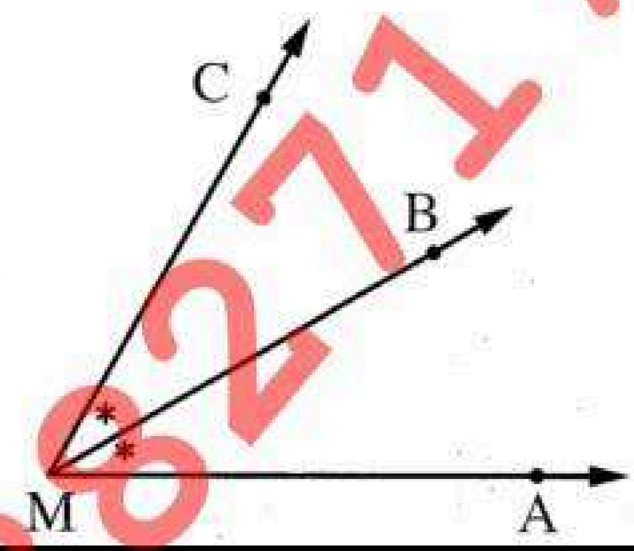
It is the ray that divides the angle into two halves (two equal angles in measure).

- **In the opposite figure :**

$\overrightarrow{MB}$ bisects $\angle$ AMC

i.e. m ($\angle$ AMB) = m ($\angle$ BMC) = $\frac{1}{2}$ m ($\angle$ AMC)

or m ($\angle$ AMC) = 2 m ($\angle$ AMB) = 2 m ($\angle$ BMC)



Lesson [3] : Congruence - Congruent Triangles

First Congruence of two line segment

Generally

Two line segments are congruent if they are equal in length

If the length of $\overline{XY}$ = the length of $\overline{ZL}$, then $\overline{XY} \equiv \overline{ZL}$

Second Congruence of two angles

Generally

Two angles are congruent if they are equal in measure.

If m ($\angle$ C) = m ($\angle$ D) , then $\angle$ C $\equiv$ $\angle$ D

Third Congruence of two polygons

Remark

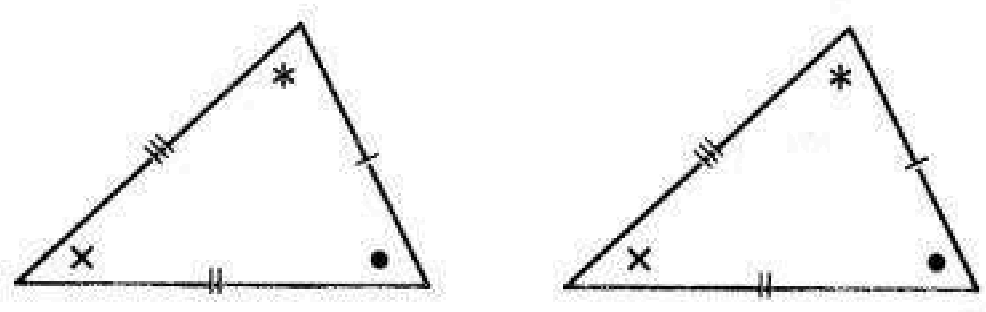
If the two polygons are congruent , then each side and each angle in one of them is congruent to its corresponding element in the other polygon.

For example :

If ABC and XYZ are two triangles in which :

1 AB = XY , AC = XZ

and BC = YZ



2 m ($\angle$ A) = m ($\angle$ X) , m ($\angle$ B) = m ($\angle$ Y)

and m ($\angle$C) = m ($\angle$ Z)

, then : Δ ABC $\equiv$ Δ XYZ

Cases of congruence of two triangles

- Two sides and the included angle
- Two angles and one side
- Three sides
- Hypotenuse and one side in the right-angled triangle

The first case (Two sides and the included angle S.A.S.)

Two triangles are congruent if two sides and the included angle of one triangle are congruent to the corresponding parts of the other triangle.

Remark

In the case of congruence of two triangles by two sides and the included angle , the included angle should be between the two sides.

The second case (Two angles and one side A.S.A.)

Two triangles are congruent if two angles and the side drawn between their vertices of one triangle are congruent to the corresponding parts of the other triangle.

The third case (Three sides S.S.S.)

Two triangles are congruent if each side of one triangle is congruent to the corresponding side of the other triangle.

Remark

If each angle of one triangle is congruent to the corresponding angle of the other triangle , it is not necessary for the two triangles to be congruent.

The fourth case (Hypotenuse and one side in the right-angled triangle R.H.S.)

Two right-angled triangles are congruent if the hypotenuse and a side of one triangle are congruent to the corresponding parts of the other triangle.

Remark

The two right-angled triangles are congruent if the two sides of the right angle in one of them are congruent to the corresponding elements in the other triangle. (This case is an application of the first case of congruence of two triangles).

Lesson [4] : Parallelism

If a straight line intersects two parallel straight lines , then each two alternate angles are equal in measure.

If a straight line intersects two parallel straight lines , then each two corresponding angles are equal in measure.

If a straight line intersects two parallel straight lines , then each two interior angles in the same side of the transversal are supplementary.

How to prove that two straight lines are parallel ?

The two straight lines are parallel if a third straight line intersects them (as a transversal) and one of the following cases is satisfied :

1. Two alternate angles have the same measure.
2. Two corresponding angles have the same measure.
3. Two interior angles in the same side of the transversal are supplementary.

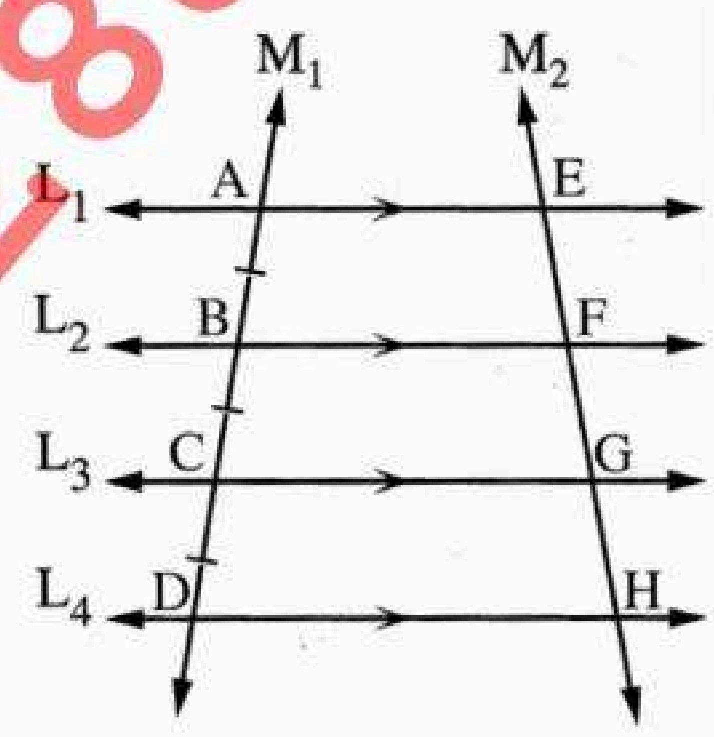
3 Using the geometric instruments or computer , draw the straight lines L_1 , L_2 , L_3 and L_4 , then draw the transversal M_1 to cut them at A , B , C and D respectively

Where : AB = BC = CD

Then draw another transversal M_2 to cut them at E , F , G and H respectively.

, then find by measuring the lengths of $\overline{EF}$, $\overline{FG}$ and $\overline{GH}$

We find that : EF = FG = GH



Generally : If : $L_1 // L_2 // L_3 // L_4$, M_1 and M_2 are two transversal in which AB = BC = CD , then EF = FG = GH

Generally

If parallel straight lines divide a straight line into segments of equal lengths , then they divide any other straight line into segments of equal lengths.

Generally : The perpendicular to one of two coplaner parallel straight lines is perpendicular to the other

And vice versa , if two coplaner straight lines are perpendicular to a third one , then the two straight lines are parallel.

Generally : If two straight lines are parallel to a third straight line , then these two straight lines are parallel.

Lesson [5] : Geometric Constructions

First Constructing a perpendicular from a point outside a straight line :

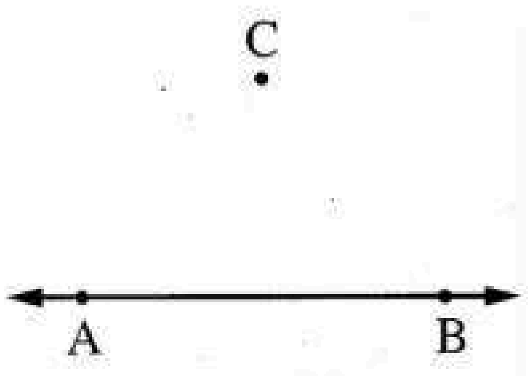


Fig. (1)

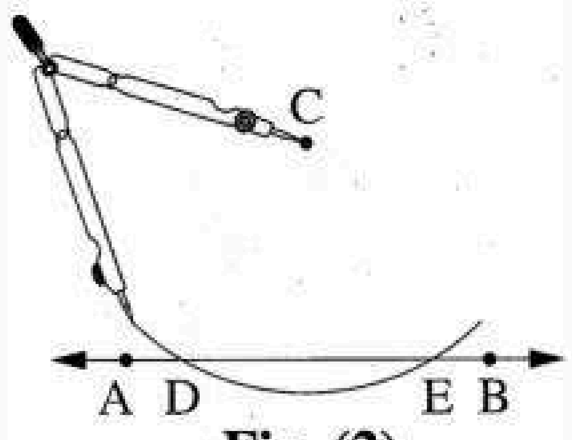


Fig. (2)

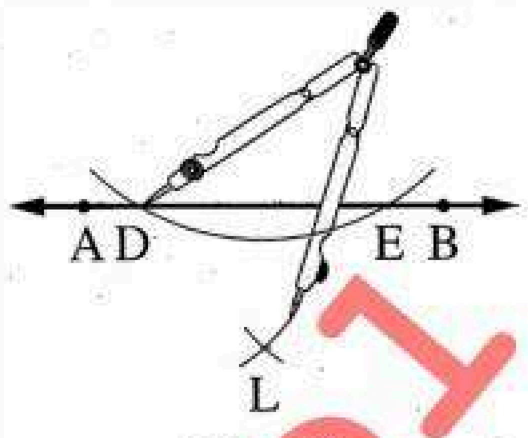


Fig. (3)

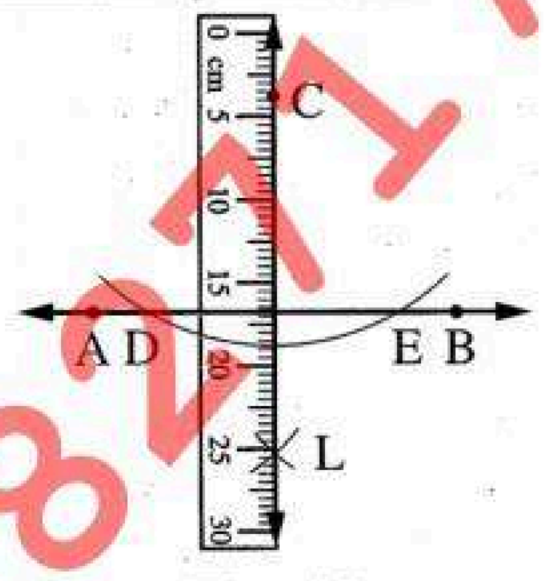


Fig. (4)

Second Drawing a perpendicular to a straight line that passes through a point which belongs to that straight line.

Fig. (1)

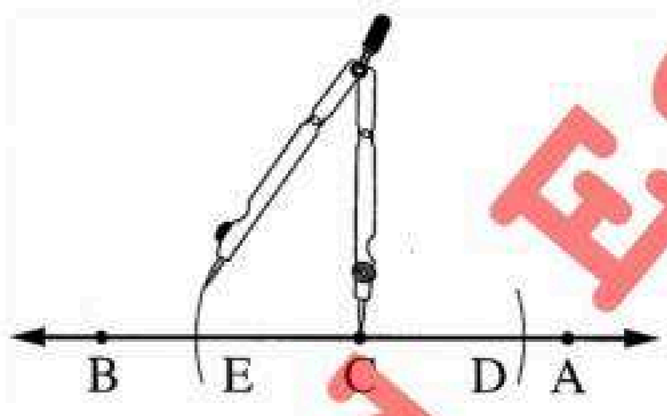


Fig. (2)

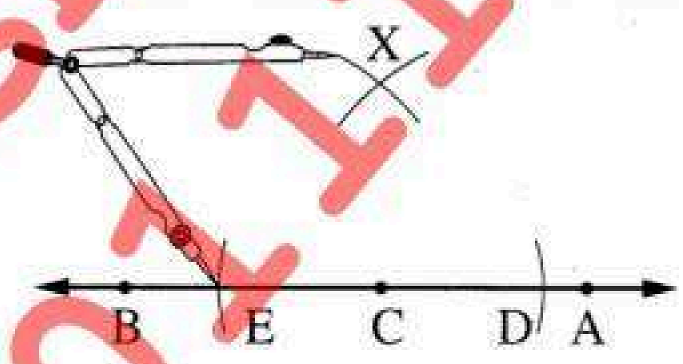


Fig. (3)

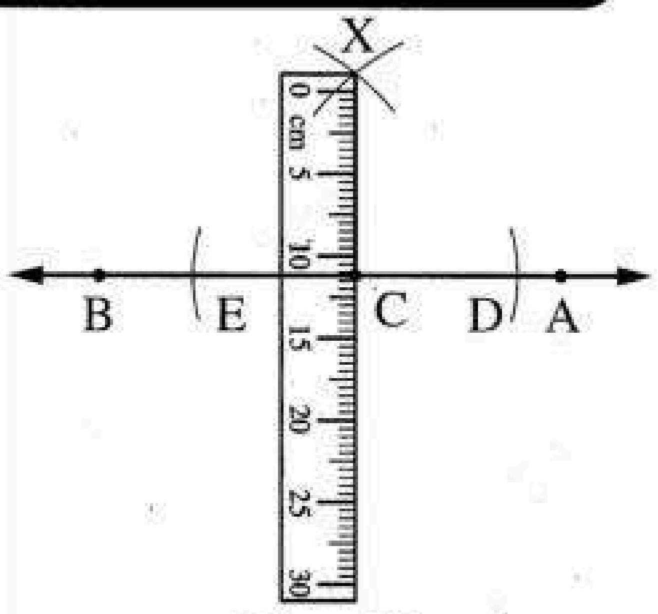


Fig. (4)

The axis of symmetry of a line segment :

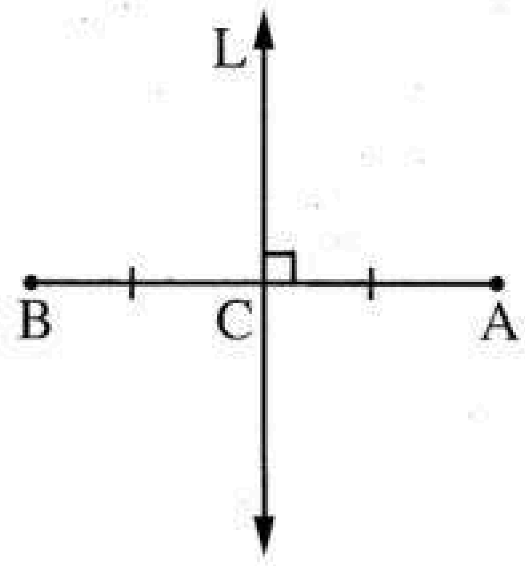
It is the straight line perpendicular to it from its midpoint.

- **In the opposite figure :**

If C is the midpoint of $\overline{AB}$ and the straight line

L $\perp$ $\overline{AB}$ from the point C

Then the straight line L is the axis of symmetry of the line segment $\overline{AB}$



Third Bisecting a given line segment "Constructing the symmetry axis of a given line segment"

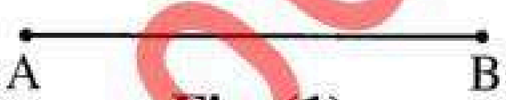


Fig. (1)

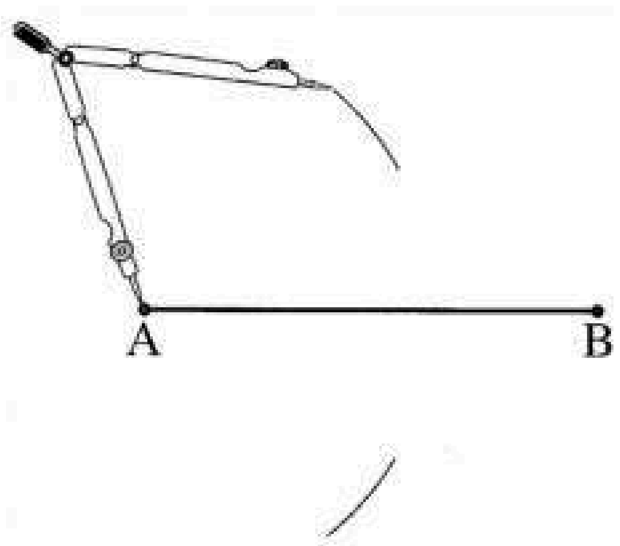


Fig. (2)

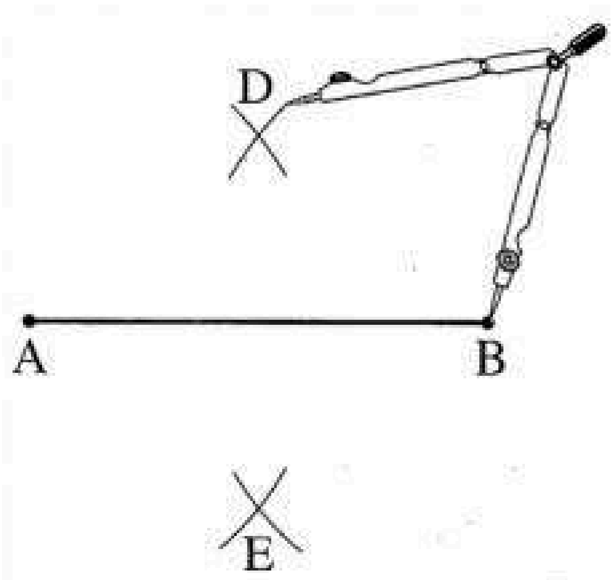


Fig. (3)

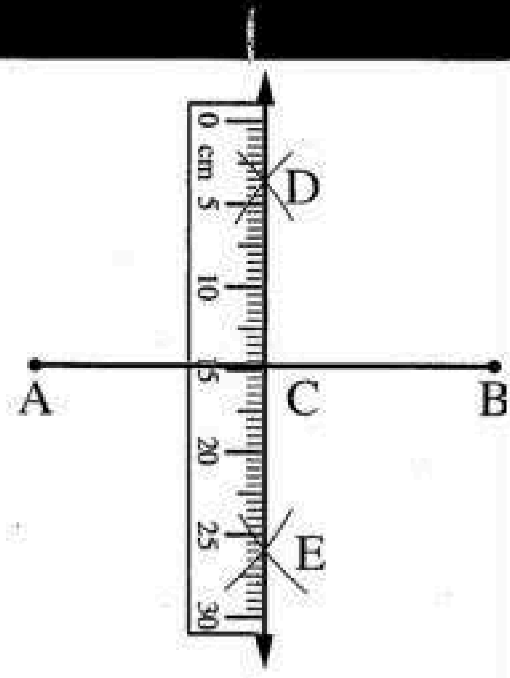
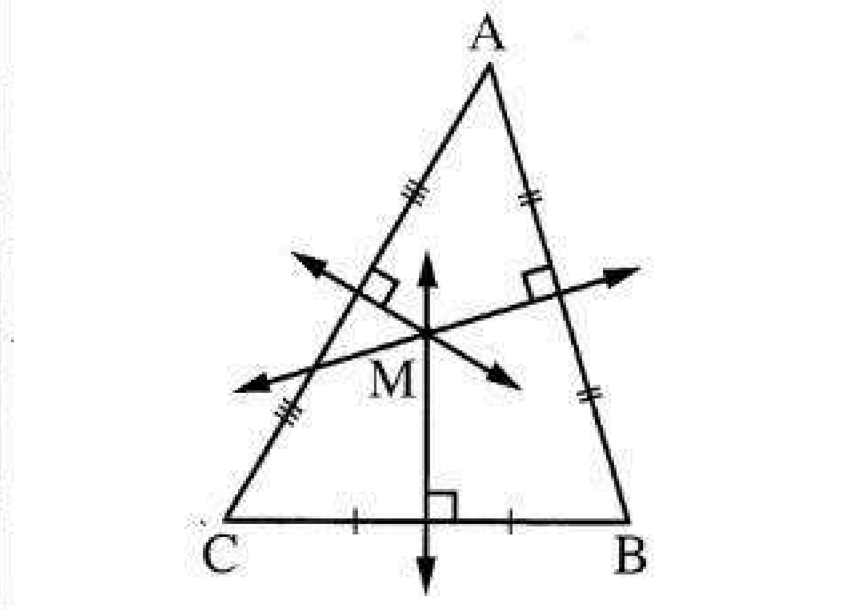
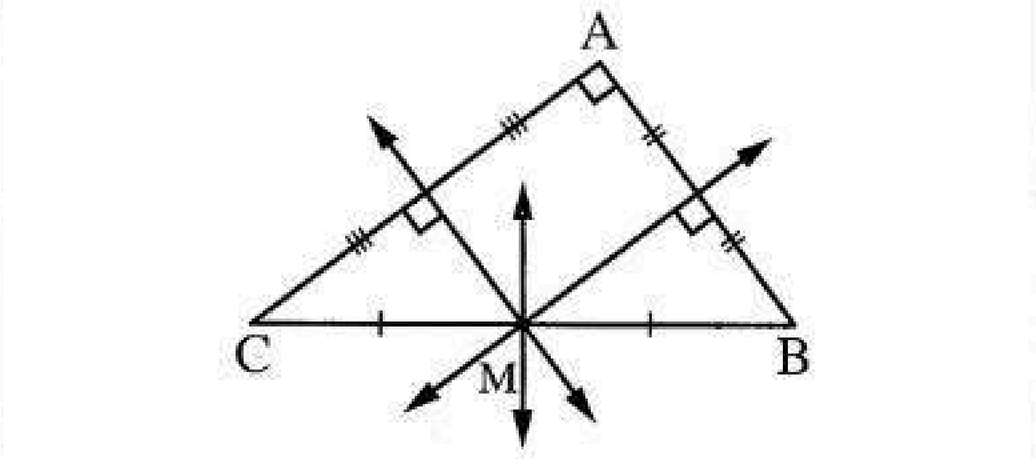
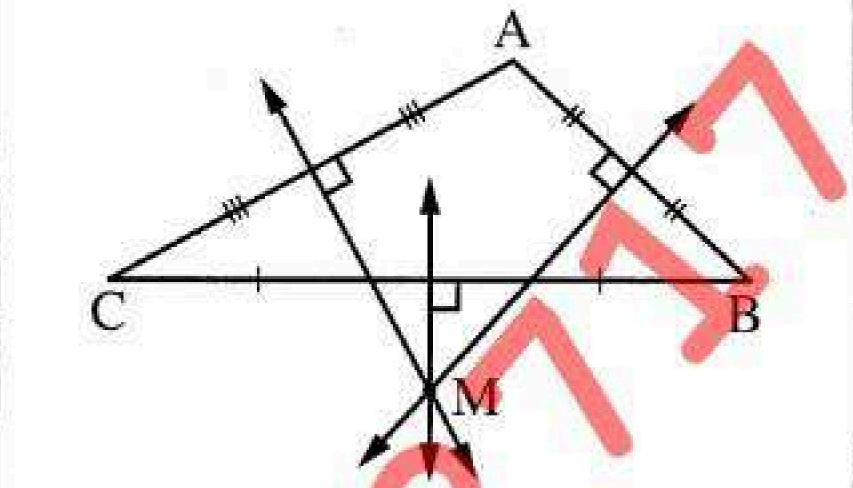


Fig. (4)

Remarks

The axes of symmetry of the sides of any triangle are intersecting at one point (say M).

The position of M differs according to the type of the triangle as follows :

Acute-angled triangle	Right-angled triangle	Obtuse-angled triangle
		
M is inside the triangle.	M is the midpoint of the hypotenuse.	M is outside the triangle.
• The lengths of the line segments joining the point of intersection of the axes of symmetry and the vertices of the triangle are equal in all previous cases. **i.e.** AM = BM = CM		

Fourth — Constructing the bisector of a given angle :

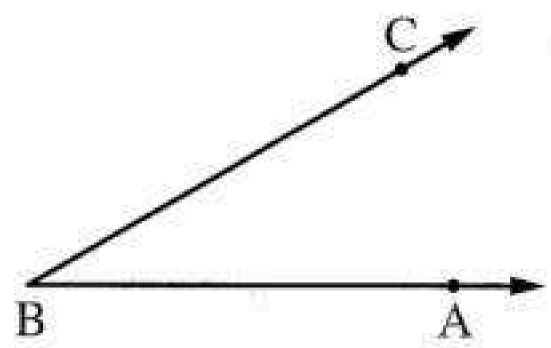


Fig. (1)

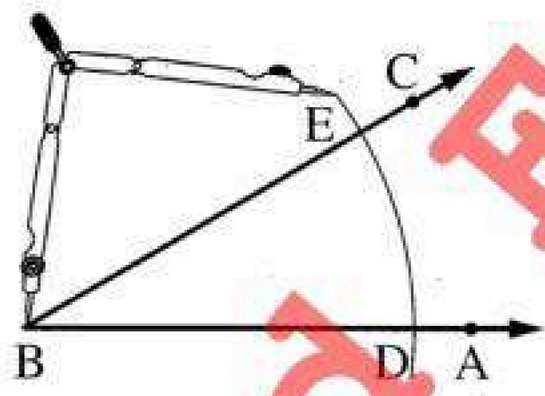


Fig. (2)

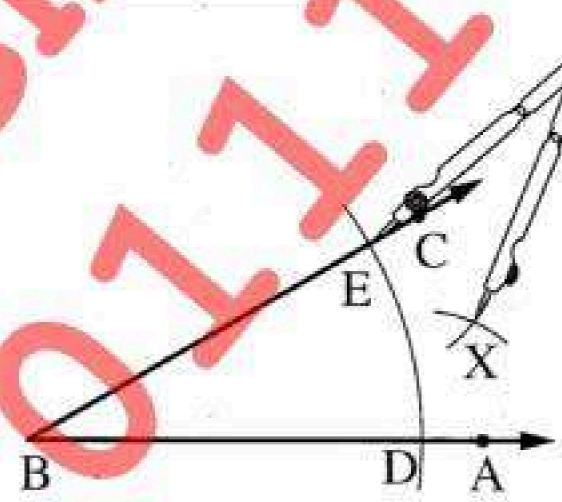


Fig. (3)

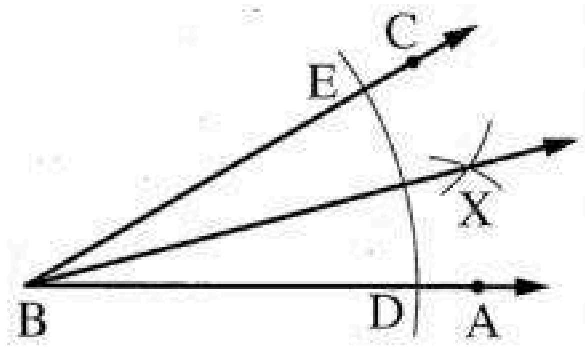


Fig. (4)

Fifth — Constructing an angle to be congruent to a given angle (without using protractor) :

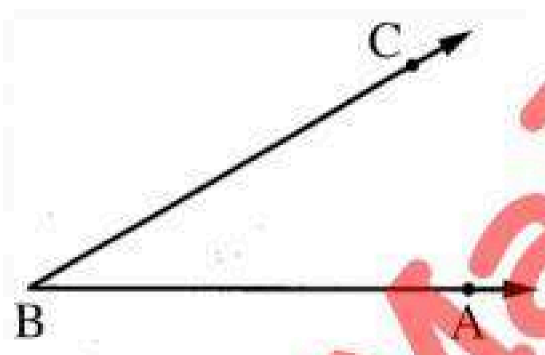


Fig. (1)

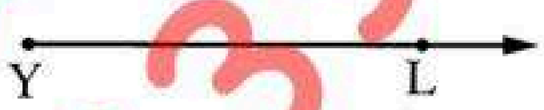


Fig. (2)

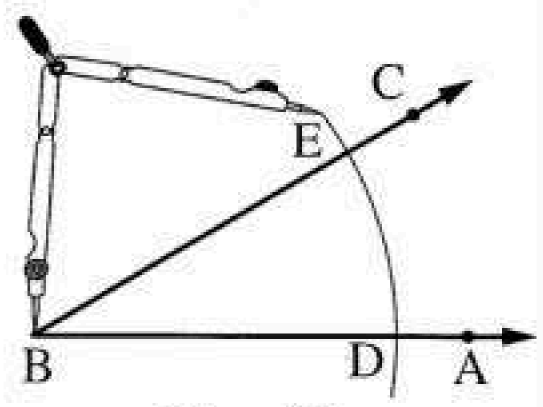


Fig. (3)

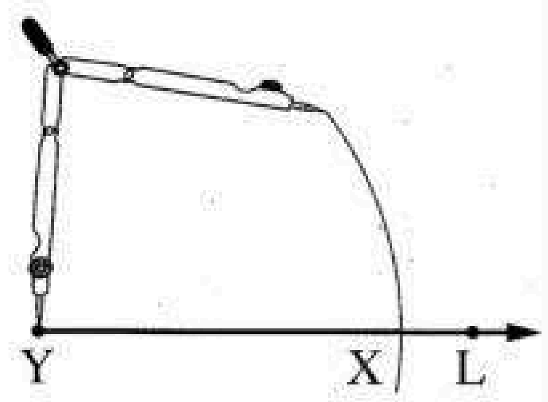


Fig. (4)

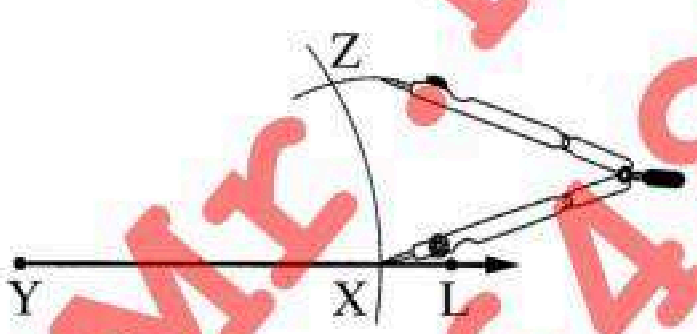


Fig. (5)

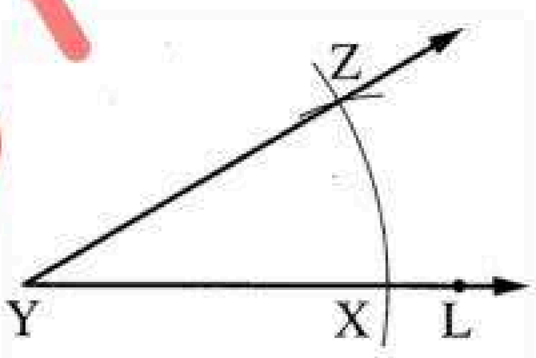


Fig. (6)

Sixth — Drawing a straight line from a given point parallel to given straight line.

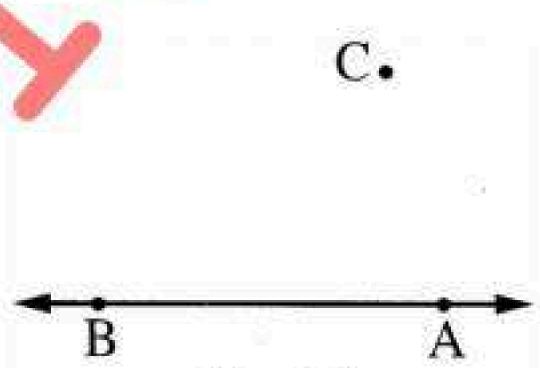


Fig. (1)

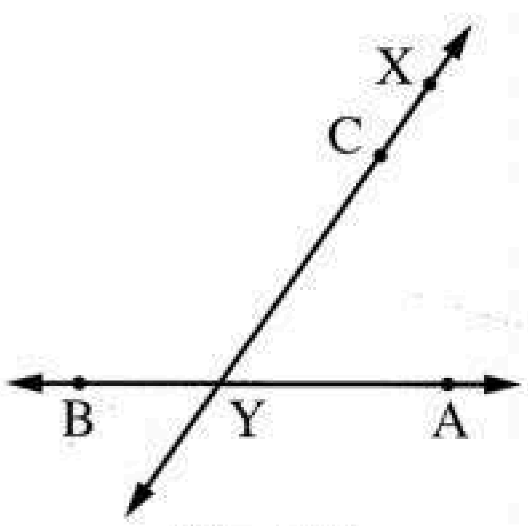


Fig. (2)

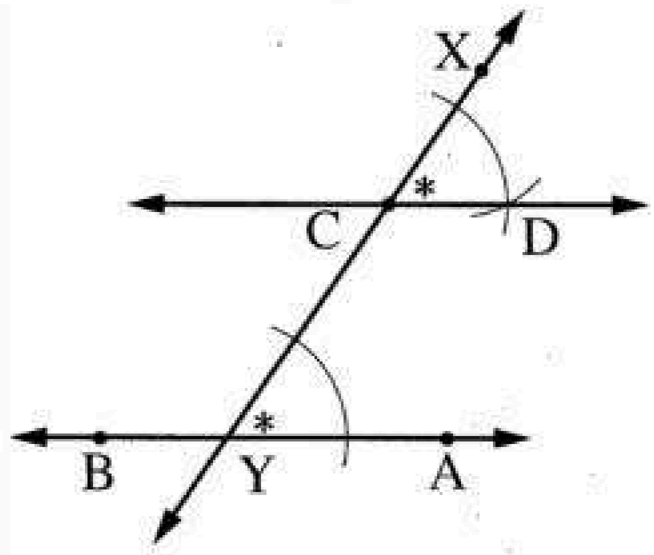


Fig. (3)

[A] : Choose The Correct Answer : -

1	The measure of the right angle = ...° (a) 90 (b) 180 (c) 270 (d) 360	A
2	The measure of the straight angle = ...° (a) 90 (b) 180 (c) 360 (d) zero	B
3	The type of the angle of measure 179° 60̀ is .... angle. (a) acute (b) obtuse (c) straight (d) right	C
4	The angle whose measure is 108° is .... angle. (a) an acute (b) a right (c) an obtuse (d) a straight	C
5	The angle whose measure is 210° is .... angle. (a) an acute (b) a right (c) an obtuse (d) a reflex	D
6	If m (∠ B) = 120° , then m (reflex ∠ B) = ...° (a) 60 (b) 120 (c) 240 (d) 180	C
7	$\overline{AB}$ .... $\overrightarrow{AB}$. (a) $\in$ (b) $\notin$ (c) $\subset$ (d) $\not\subset$	C
8	If m (∠ A) + m (∠ B) = 90° , then ∠ A , ∠ B are .... angles. (a) complementary (b) supplementary (c) equal (d) adjacent	A
9	The angle of measure 70° complements an angle of measure ....° (a) 90 (b) 20 (c) 180 (d) 110	B
10	If ∠ A complements ∠ B , m (∠ A) = m (∠ B) , then m (∠ A) = ...° (a) 90 (b) 180 (c) 45 (d) 60	C
11	The acute angle complements .... angle. (a) an acute (b) an obtuse (c) a right (d) a reflex	A
12	If the two adjacent angles are complementary , then their outer sides are .... (a) perpendicular. (b) coincident. (c) on the same straight line. (d) skew.	A

13	The two angles 35° , 55° are .... (a) complementary. (b) supplementary. (c) adjacent. (d) reflex.	A
14	If m (∠ X) = 2 m (∠ Y) , ∠ X and ∠ Y are two complementary angles , then m (∠ Y) = ... (a) 90° (b) 45° (c) 30° (d) 15°	C
15	The supplementary angle of the angle of measure 70° is .... (a) 30° (b) 110° (c) 20° (d) 290°	B
16	The acute angle supplements .... angle. (a) an acute (b) an obtuse (c) a right (d) a reflex	B
17	If one of two supplementary angles is right. then the other is .... angle. (a) an acute (b) a right (c) an obtuse (d) a straight	B
18	The obtuse angle supplements .... angle. (a) an acute (b) an obtuse (c) a right (d) a reflex	A
19	If ∠ A supplements ∠ B and ∠ A ≡ ∠ B , then m (∠ A) = ...° (a) 180 (b) 90 (c) 360 (d) 45	B
20	The sum of the measures of two adjacent angles formed by a straight line and a ray with a starting point on this straight line is .... (a) 90° (b) 180° (c) 270° (d) 360°	B
21	If ∠ A and ∠ B are supplementary angles and m (∠ A) = 2 m (∠ B) , then m (∠ A) = ...° (a) 90 (b) 60 (c) 180 (d) 120	D
22	If the ratio between two adjacent supplementary angles is 2 : 3 , then the measure of the smallest angle is ....° (a) 108 (b) 36 (c) 72 (d) 125	C
23	If ∠ A ≡ ∠ B , ∠ A and ∠ B are two supplementary angles , then $\frac{1}{3}$ m (∠ A) = ... (a) 15° (b) 30° (c) 40° (d) 60°	B

24	The sum of measures of the accumulative angles at a point equals .... (a) 90° (b) 180° (c) 630° (d) 360°	D
25	If AB = XY , then $\overline{AB}$ .... $\overline{XY}$ (a) > (b) ≡ (c) < (d) ≠	B
26	In Δ ABC , if m (∠ A) = 30° , m (∠ B) = 90° , then m (∠ C) = ... (a) 60° (b) 30° (c) 45° (d) 90°	A
27	If Δ XYZ ≡ Δ LMN , then m (∠ Y) = m (∠ ....) (a) L (b) M (c) N (d) X	B
28	If Δ ABC ≡ Δ XYZ and m (∠ C) = 50° , then m (∠ ....) = 50° (a) X (b) Y (c) Z (d) M	C
29	If $\overline{AB}$ ≡ $\overline{XY}$, then AB – XY = ... (a) AB (b) XY (c) 1 (d) zero	D
30	If Δ ABC ≡ Δ XYZ , then BC = ... (a) YZ (b) XZ (c) XY (d) AC	A
31	If Δ ABC ≡ Δ MNO , m (∠ M) = 40° and m (∠ C) = 60° , then m (∠ B) = ...° (a) 40 (b) 80 (c) 60 (d) 100	B
32	If Δ ABC ≡ Δ XYZ and m (∠ A) + m (∠ X) = 100°, then m (∠ A) = ...° (a) 100 (b) 80 (c) 40 (d) 50	D
33	If Δ ABC ≡ Δ XYZ , m (∠ A) + m (∠ C) = 110° , then m (∠ Y) = ...° (a) 50 (b) 70 (c) 80 (d) 100	B
34	If two straight lines are parallel to a third straight line , then they are .... (a) perpendicular. (b) intersecting. (c) parallel. (d) congruent.	C
35	If parallel straight lines divide a straight line into segments of equal lengths , then they divide any other straight line into segments of .... lengths. (a) parallel (b) not equal (c) equal (d) perpendicular	C

36

The straight line that is perpendicular to one of two parallel lines is …………… to the other.

(a) parallel (b) congruent (c) perpendicular (d) equal

C

37

If $\overleftrightarrow{AB} \parallel \overleftrightarrow{XY}$, then $\overleftrightarrow{AB} \cap \overleftrightarrow{XY}$ = ……………

(a) $\{B\}$ (b) $\overline{AX}$

(c) $\varnothing$ (d) $\{Y\}$

C

38

If $L_1 \parallel L_2$ and $L_1 \perp L_3$, then ……………

(a) $L_1 \perp L_2$ (b) $L_1 \parallel L_3$ (c) $L_2 \parallel L_3$ (d) $L_2 \perp L_3$

D

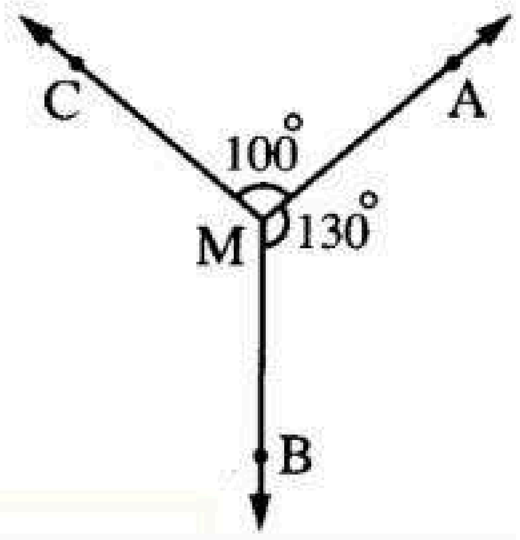
39

In the opposite figure :

m (∠ CMB) = ……………°

(a) 230 (b) 100

(c) 130 (d) 30



C

40

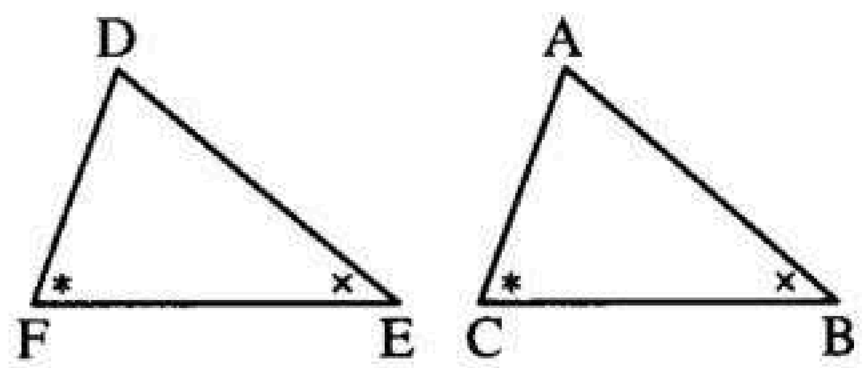
In the opposite figure :

The necessary condition to make

Δ ABC ≡ Δ DEF is ……………

(a) AB = DE (b) AC = DF

(c) BC = EF (d) m (∠ A) = m (∠ D)



C

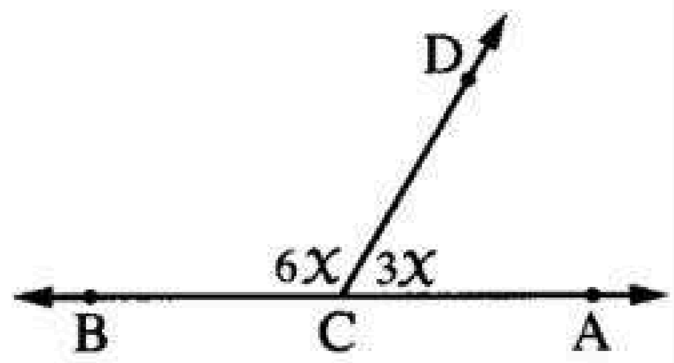
41

In the opposite figure :

$\overleftrightarrow{AB} \cap \overrightarrow{CD} = \{C\}$, then x = ……………°

(a) 180 (b) 30

(c) 20 (d) 120



C

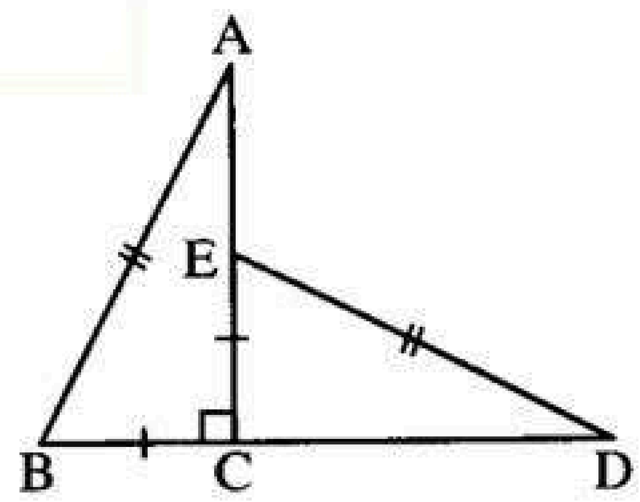
42

In the opposite figure :

If AB = DE , BC = EC , $\overline{AC} \perp \overline{BD}$, then m (∠ A) = ……………

(a) m (∠ B) (b) m (∠ D)

(c) m (∠ DEC) (d) m (∠ ACD)

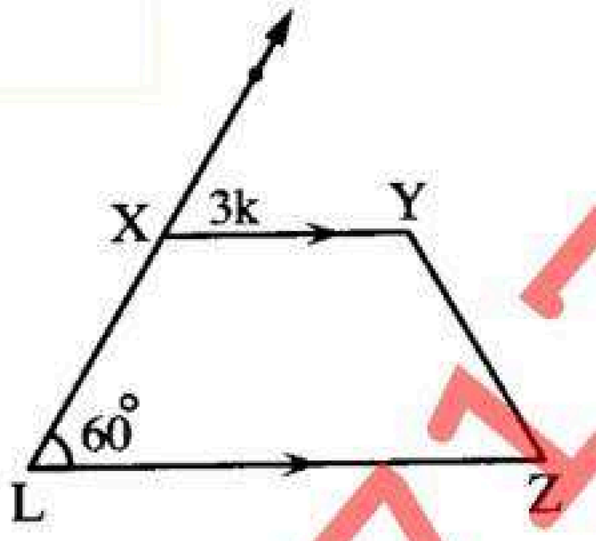


B

43 In the opposite figure : If $\overline{XY} \parallel \overline{LZ}$, then k = ... °

(a) 90 (b) 60

(c) 30 (d) 20



D

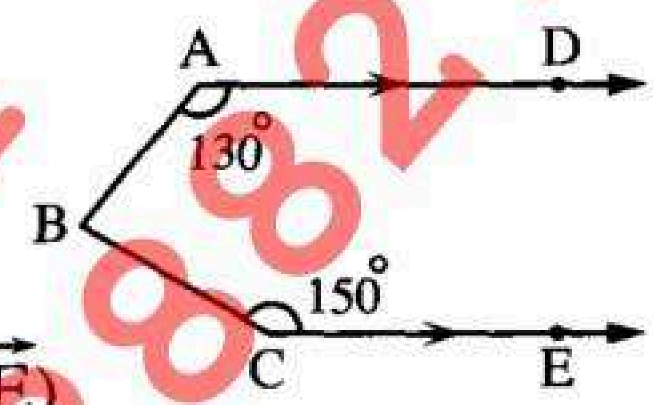
44 In the opposite figure :

$\overrightarrow{AD} \parallel \overrightarrow{CE}$

, m (∠ B) = ... °

(Hint : Draw a line passing through B and parallel to $\overrightarrow{AD}$ and $\overrightarrow{CE}$)

(a) 70 (b) 80 (c) 90 (d) 100

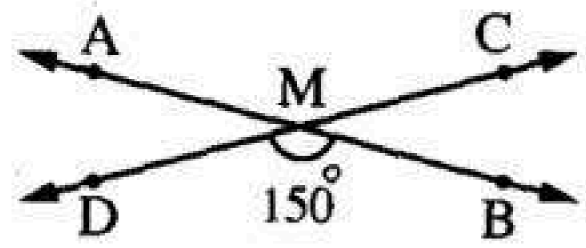


B

45 In the opposite figure :

$\overleftrightarrow{AB} \cap \overleftrightarrow{DC} = \{M\}$, m (∠ AMC) = ... °

(a) 30 (b) 210 (c) 150 (d) 60

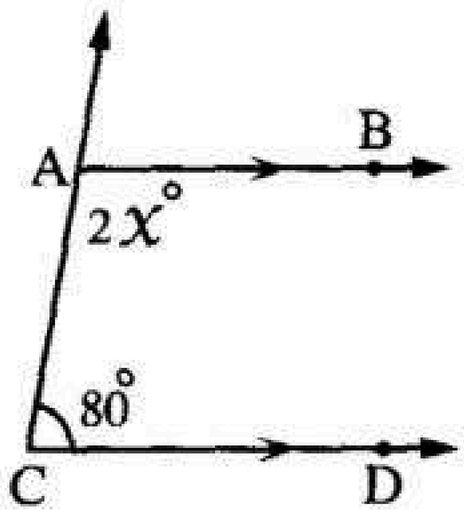


C

46 In the opposite figure :

x = ... °

(a) 40 (b) 80 (c) 50 (d) 100



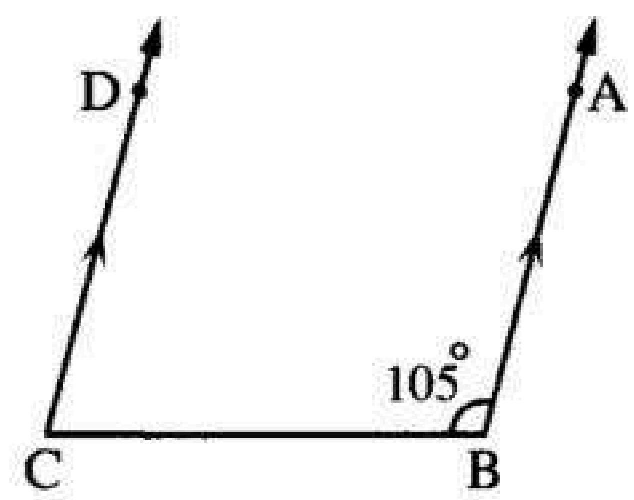
C

47 In the opposite figure :

m (∠ C) = ...

(a) 105° (b) 75°

(c) 45° (d) 90°

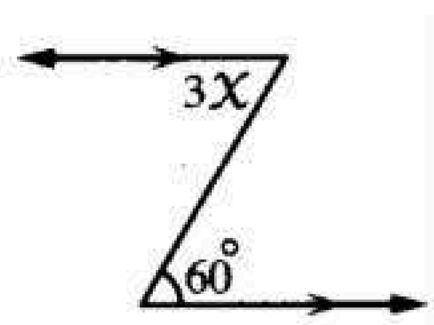


B

48 In the opposite figure : x = ... °

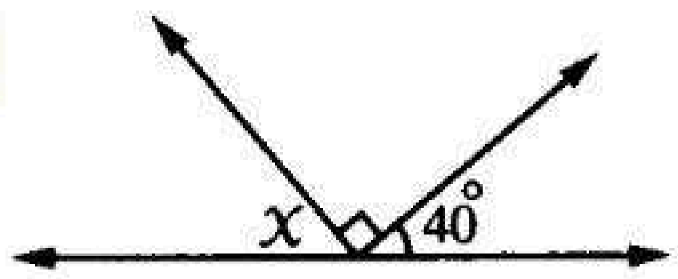
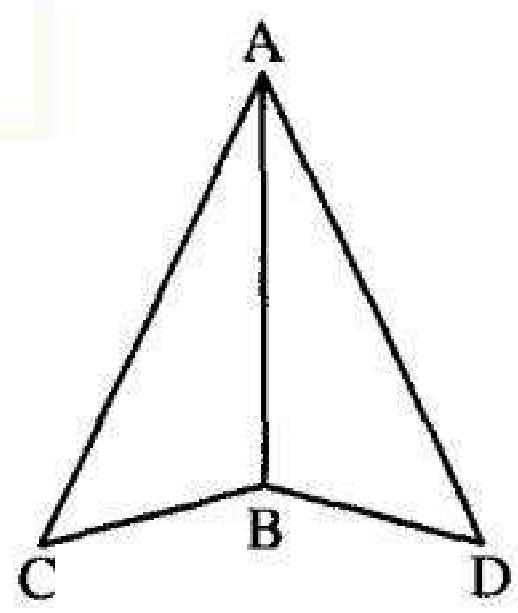
(a) 20 (b) 30

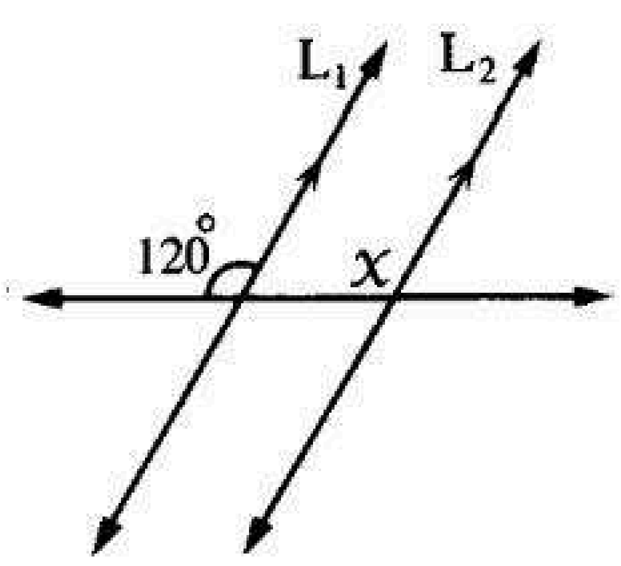
(c) 40 (d) 120



A

[A] : Complete the Following : -

1	The acute angle , whose measure is less than …………… and more than ……………
2	$\overrightarrow{AB} \cup \overrightarrow{AC}$ = ……………
3	The type of the angle of measure $89^\circ\ 60'$ is ……………
4	If the two adjacent angles are supplementary angles , then their outer sides are ……………
5	The two bisectors of two adjacent supplementary angles are ……………
6	The two adjacent angles formed by a straight line and a ray with a starting point on this straight line are ……………
7	**In the opposite figure :** x = ……………° 
8	If two straight lines intersect , then the measures of each two vertically opposite angles are ……………
9	The two vertically opposite angles are …………… in measure.
10	If Δ ABC ≡ Δ XYZ , then ∠ CAB ≡ ∠ ……………
11	If the polygon ABCDE ≡ the polygon XYZEF , then BC = ……………
12	If polygon AXYD ≡ polygon BXYC , then AD = ……………
13	**In the opposite figure :** If Δ ABC ≡ Δ ABD , the perimeter of the figure ACBD = 20 cm. , AB = 6 cm. , then the perimeter of Δ ABC = …………… cm. 

14	The two triangles are congruent if two sides and .... of one triangle are congruent with their corresponding parts in the other triangle.
15	The two right-angled triangles are congruent if ....
16	The two right-angled triangles are congruent if the .... and a side of one triangle are congruent with their corresponding parts in the other triangle.
17	Two triangles are congruent if each .... of one triangle is congruent to its corresponding part of the other triangle.
18	If $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ lie in the same plane and $\overleftrightarrow{AB} \cap \overleftrightarrow{CD} = \varnothing$, then $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ are ....
19	If two straight lines are parallel to a third line , then the two straight lines are ....
20	If a straight line intersects two parallel straight lines , then every two corresponding angles are ....
21	If a straight line intersects two parallel lines , then each two alternate angles are ....
22	If a straight line intersects two parallel straight lines , then each two interior angles in the same side of the transversal are ....
23	The straight line that is perpendicular to one of two parallel lines is also ....
24	If two straight lines are perpendicular to a third line , then the two straight lines are ....
25	Two straight lines are parallel if they are cut by a transversal such that the two interior angles on one side of the transversal are ....
26	**In the opposite figure :** L_1 , L_2 are two parallel straight lines , then $x =$ ....$^\circ$ 

[B] : Essay Problems : -

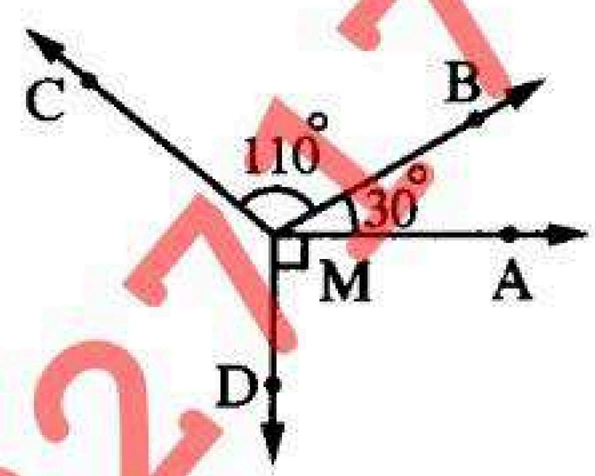
1

In the opposite figure :

m (∠ AMB) = 30° , m (∠ BMC) = 110°

, m (∠ AMD) = 90°

Find : m (∠ CMD)

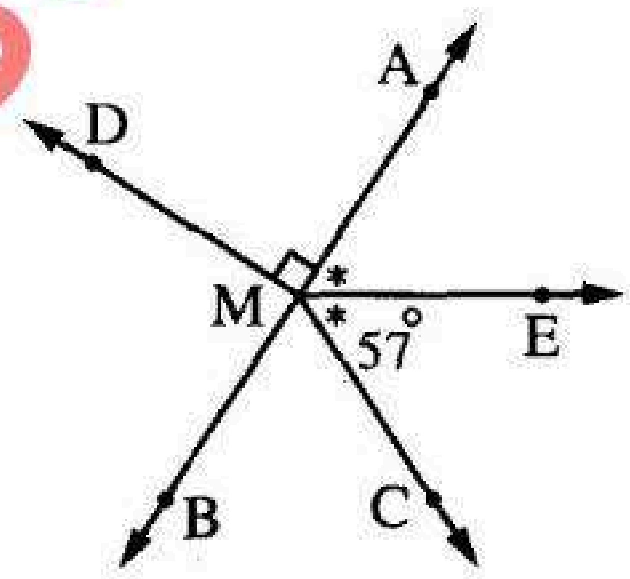


2016 Exam (15) Question (3) (b)

2

In the opposite figure :

Calculate : m (∠ DMC) (give reason)



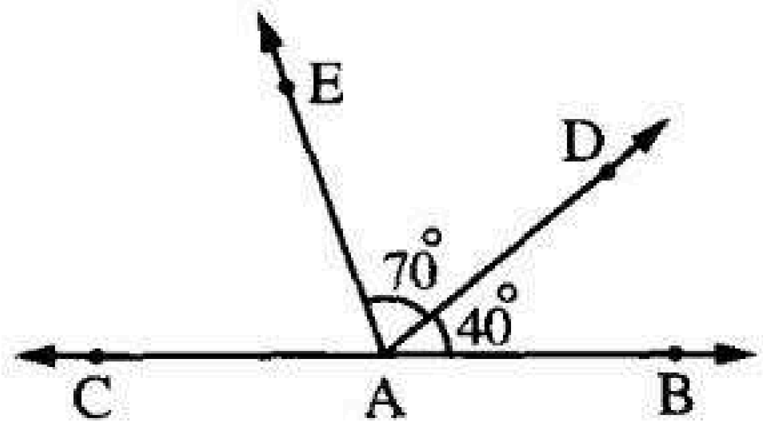
2016 Exam (2) Question (3) (b)

3

In the opposite figure :

m (∠ BAD) = 40° , m (∠ DAE) = 70° , A ∈ $\overleftrightarrow{BC}$

Prove that : $\overrightarrow{AE}$ bisects ∠ DAC



2016 Exam (4) Question (3) (a)

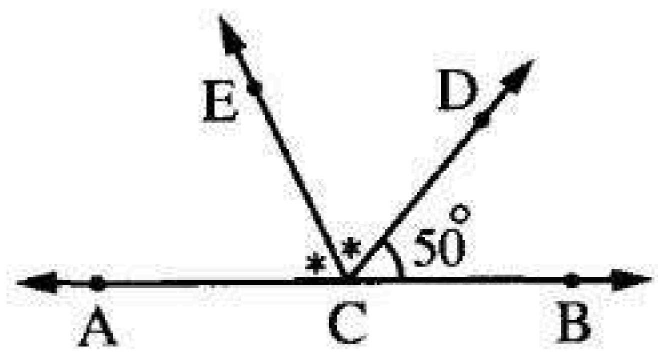
4

In the opposite figure :

C ∈ $\overleftrightarrow{AB}$, m (∠ BCD) = 50° ,

$\overrightarrow{CE}$ bisects ∠ DCA

Find : m (∠ ACE)



2016 Exam (3) Question (5) (b)

5

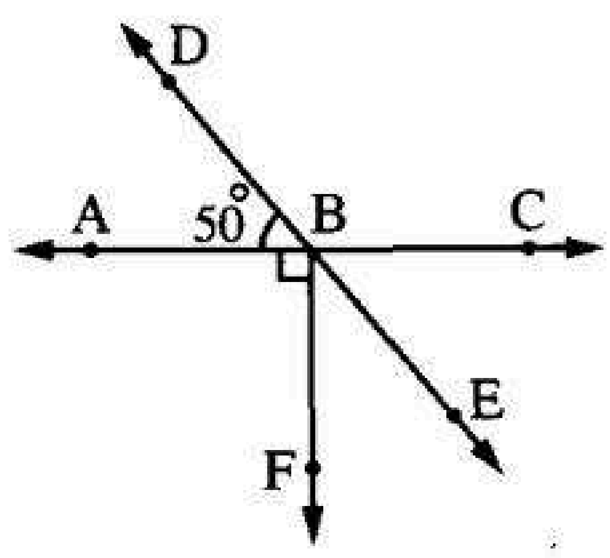
In the opposite figure :

$\overleftrightarrow{AC} \cap \overleftrightarrow{DE} = \{B\}$, m (∠ ABD) = 50°

and m (∠ ABF) = 90°

Find showing steps :

(1) m (∠ DBC)   (2) m (∠ CBE)   (3) m (∠ FBE)



2016 Exam (12) Question (3) (a)

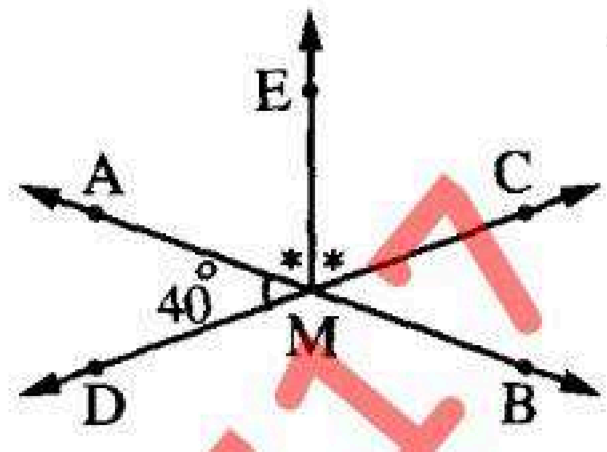
6

In the opposite figure :

$\overleftrightarrow{AB} \cap \overleftrightarrow{DC} = \{M\}$

, $\overrightarrow{ME}$ bisects $\angle$ AMC and m ($\angle$ AMD) = 40°

Find : m ($\angle$ AME) , m ($\angle$ BME)



2016 Exam (8) Question (3) (a)

7

In the opposite figure :

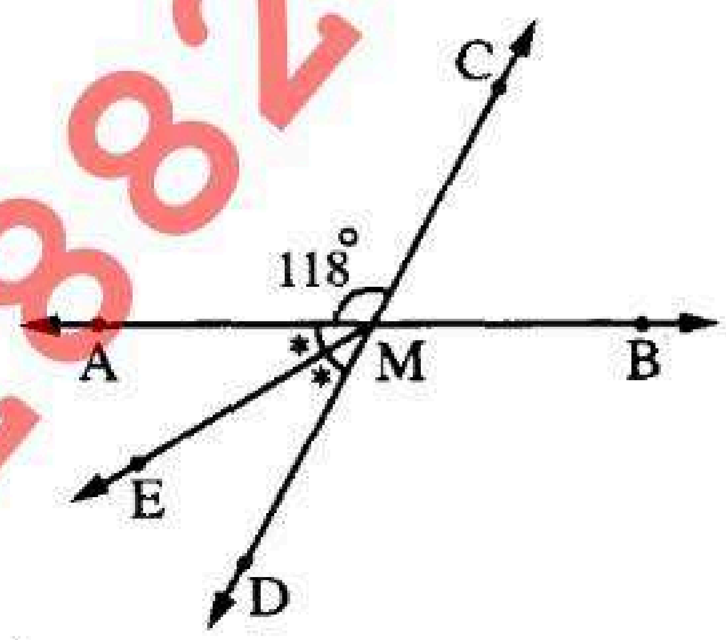
$\overleftrightarrow{AB} \cap \overleftrightarrow{CD} = \{M\}$, $\overrightarrow{ME}$ bisects $\angle$ AMD

, m ($\angle$ AMC) = 118° **Find :**

(1) m ($\angle$ BMD)

(2) m ($\angle$ BMC)

(3) m ($\angle$ AME)



2016 Exam (6) Question (3) (a)

8

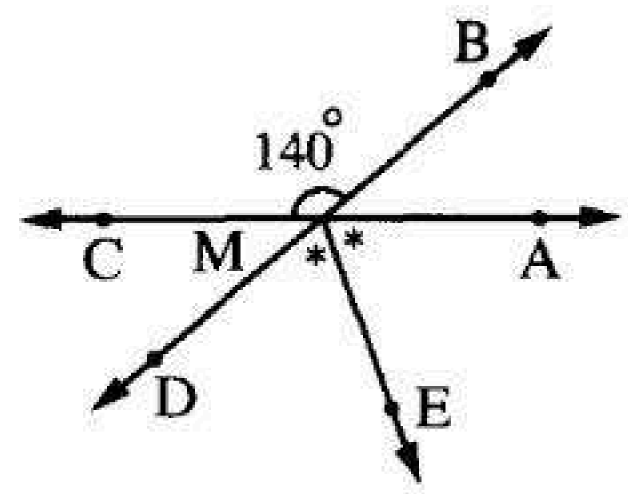
In the opposite figure :

$\overleftrightarrow{AC} \cap \overleftrightarrow{BD} = \{M\}$,

m ($\angle$ CMB) = 140° ,

$\overrightarrow{ME}$ bisects $\angle$ AMD

Find : (1) m ($\angle$ AMB) (2) m ($\angle$ AME)



2016 Exam (1) Question (3) (b)

9

Mention two cases of congruency of two triangles.

2016 Exam (1) Question (4) (a)

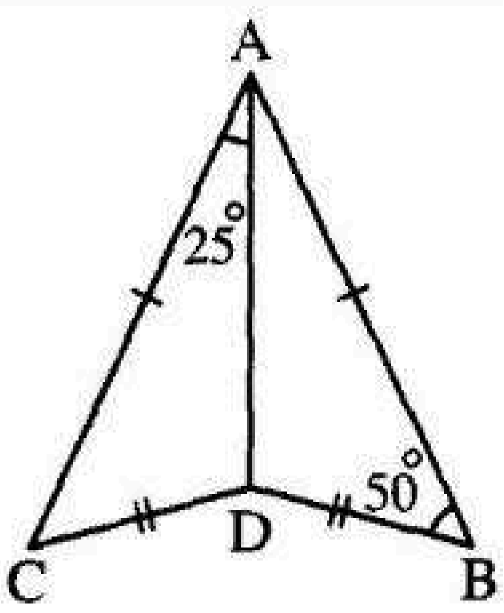
10

Complete from the opposite figure :

(1) The common side between the two triangles is ....

(2) Δ ABD $\equiv \Delta$ ....

(3) m ($\angle$ ADB) = ...°



2016 Exam (5) Question (4) (a)

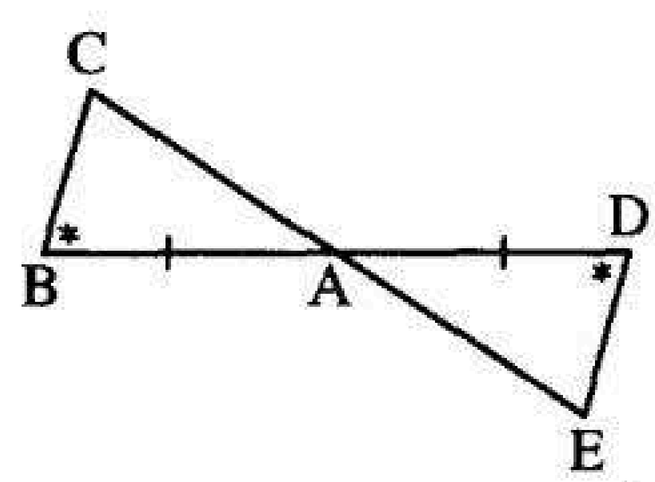
11

In the opposite figure :

$\overline{EC} \cap \overline{BD} = \{A\}$, AB = AD and

m ($\angle$ ABC) = m ($\angle$ ADE)

Does Δ ADE $\equiv \Delta$ ABC ? Why ?



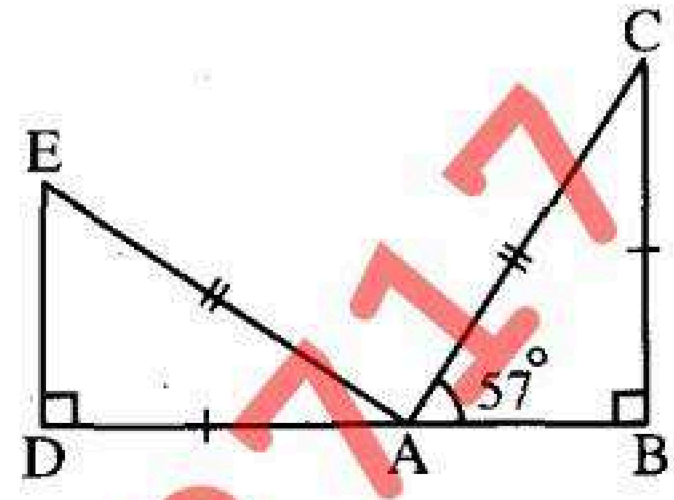
2016 Exam (13) Question (4) (b)

12

In the opposite figure :

Prove that : Δ ABC $\equiv$ Δ EDA

, then find the measures of angles of Δ ADE



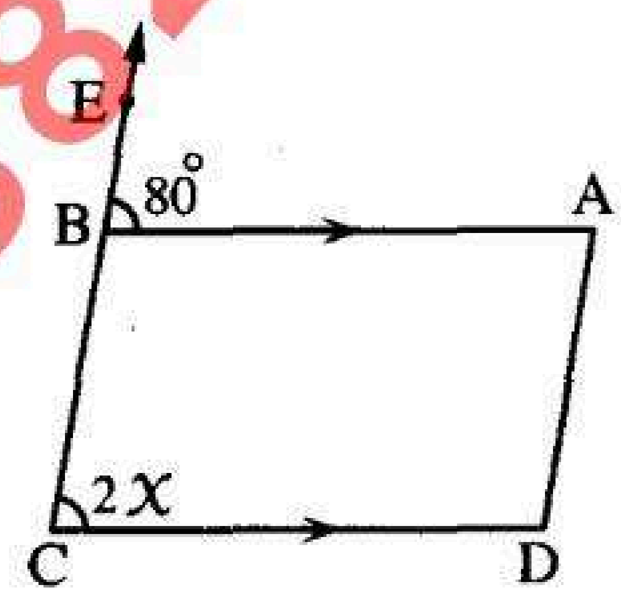
2016 Exam (3) Question (4) (a)

13

In the opposite figure :

$\overline{AB}$ // $\overline{DC}$

Find the value of : x



2016 Exam (14) Question (3) (b)

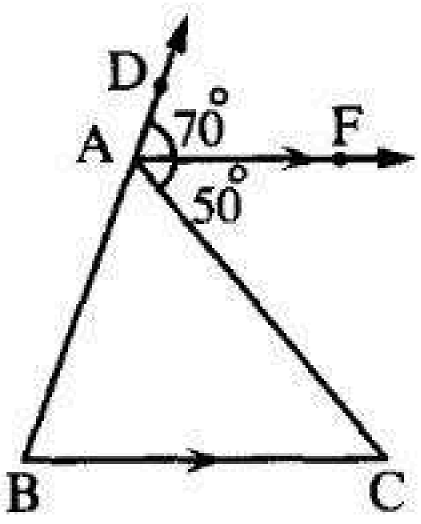
14

In the opposite figure :

$\overrightarrow{AF}$ // $\overrightarrow{BC}$, m ($\angle$ DAF) = 70° , m ($\angle$ FAC) = 50°

Find :

(1) m ($\angle$ B) (2) m ($\angle$ C) (3) m ($\angle$ BAC)



2016 Exam (6) Question (5) (a)

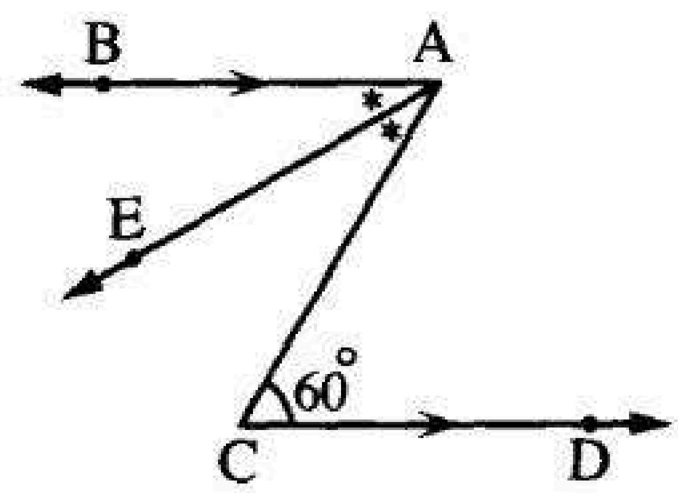
15

In the opposite figure :

$\overrightarrow{AB}$ // $\overrightarrow{CD}$, $\overrightarrow{AE}$ bisects $\angle$ BAC

, m ($\angle$ C) = 60°

Find : m ($\angle$ BAE)



2016 Exam (8) Question (5) (a)

16

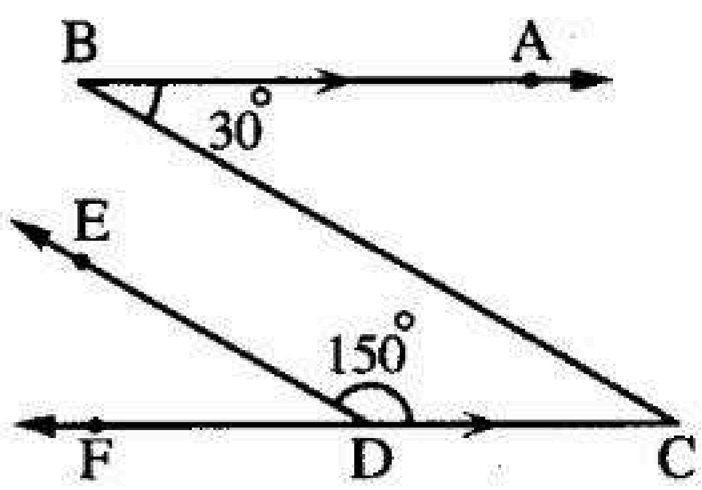
In the opposite figure :

$\overline{BA}$ // $\overline{CD}$, m ($\angle$ ABC) = 30°

, m ($\angle$ EDC) = 150°

Is $\overline{DE}$ // $\overline{CB}$? Why ?

(Write the steps of your answer)



2016 Exam (9) Question (5) (b)

17

Draw $\angle$ ABC whose measure is 60° and bisect it. (Don't remove the arcs)

2016 Exam (12) Question (4) (a)

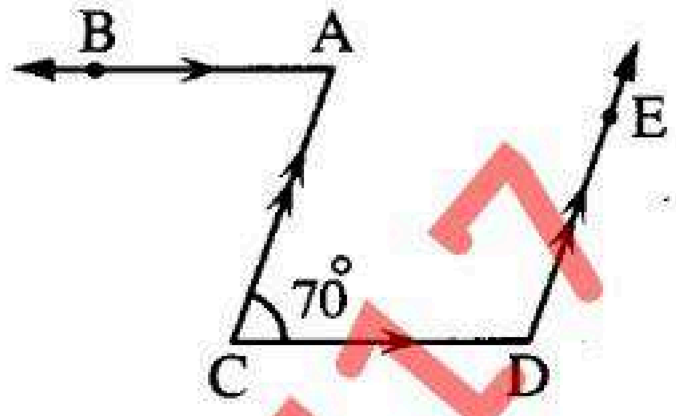
18

In the opposite figure :

$\overrightarrow{AB} \parallel \overrightarrow{DC}$, $\overrightarrow{CA} \parallel \overrightarrow{DE}$, m ($\angle$ C) = 70°

Find : (1) m ($\angle$ A) (give reason)

(2) m ($\angle$ D) (give reason)



2016 Exam (1) Question (5) (b)

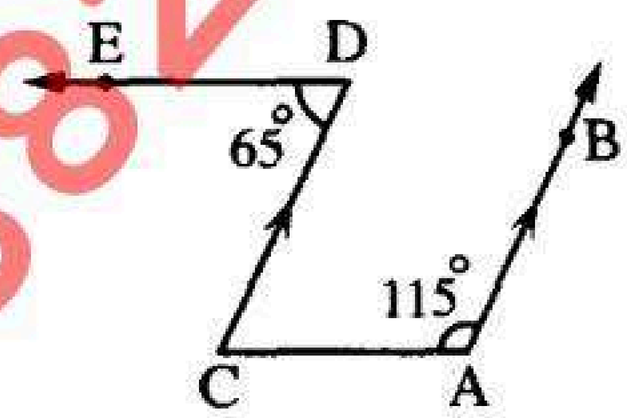
19

In the opposite figure :

$\overrightarrow{AB} \parallel \overrightarrow{CD}$, m ($\angle$ BAC) = 115° ,

m ($\angle$ EDC) = 65°

Does $\overrightarrow{AC} \parallel \overrightarrow{DE}$? Why ?



2016 Exam (13) Question (5) (a)

20

In the opposite figure :

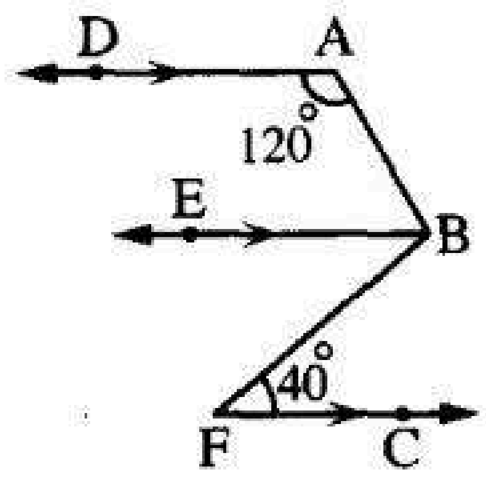
$\overrightarrow{AD} \parallel \overrightarrow{BE} \parallel \overrightarrow{FC}$, m ($\angle$ A) = 120°

, m ($\angle$ BFC) = 40°

Find : (1) m ($\angle$ ABE)

(2) m ($\angle$ FBE)

(3) m ($\angle$ ABF)



2016 Exam (6) Question (4) (b)

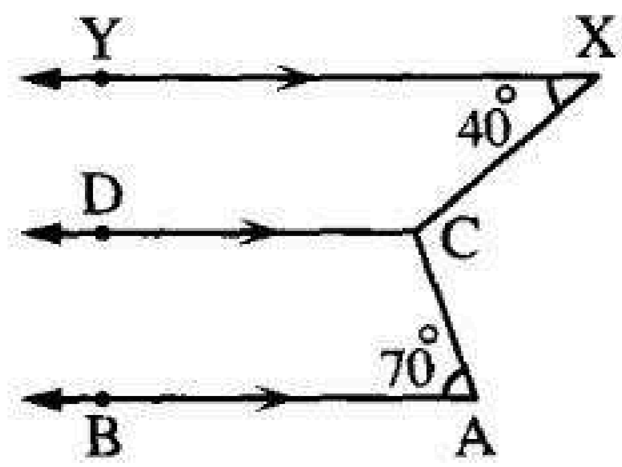
21

In the opposite figure :

$\overrightarrow{AB} \parallel \overrightarrow{CD} \parallel \overrightarrow{XY}$,

m ($\angle$ A) = 70° , m ($\angle$ X) = 40°

Find : m ($\angle$ ACX) and m ($\angle$ DCX)



2016 Exam (7) Question (3) (b)

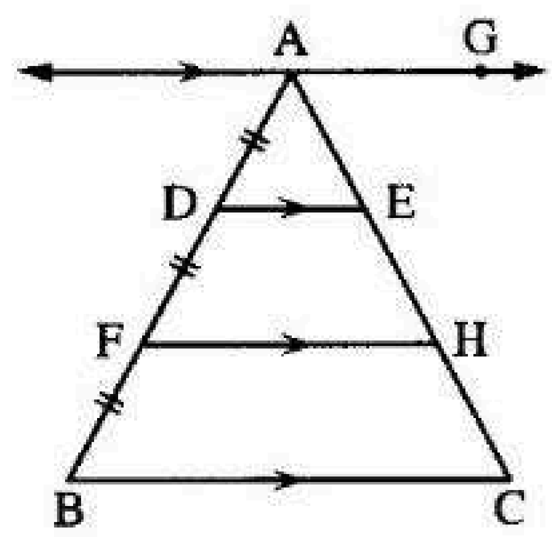
22

In the opposite figure :

$\overleftrightarrow{AG} \parallel \overline{DE} \parallel \overline{FH} \parallel \overline{BC}$ and AC = 12 cm.

If AD = DF = FB

, find the length of : $\overline{AH}$



2016 Exam (11) Question (5) (b)

23

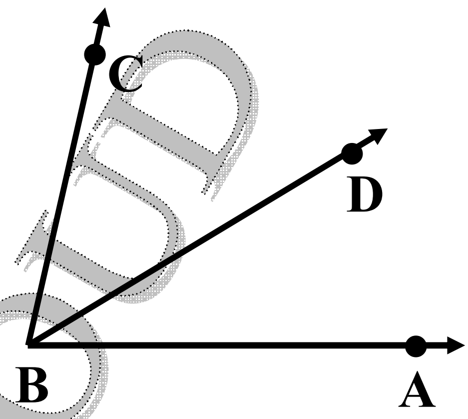
Draw $\overline{AB}$ where AB = 5 cm. , using ruler and compasses draw the axis of symmetry of $\overline{AB}$ (Do not remove the arcs).

2016 Exam (11) Question (3) (b)

Adjacent angles:

Two angles are said to be adjacent if they have a common vertex, a common side and the other two sides on opposite sides of this common side.

$\angle ABD$, $\angle DBC$ are adjacent angles



Complementary angles:

Two angles are said to be complementary if their sum is 90°

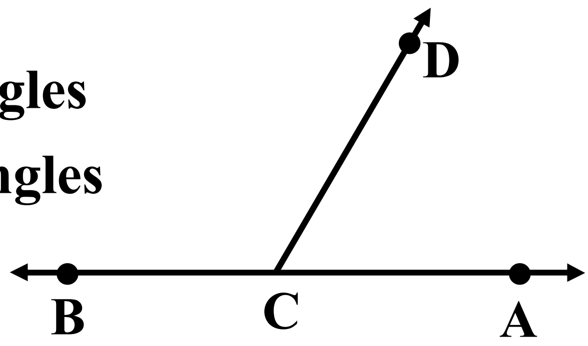
Supplementary angles:

Two angles are said to be supplementary if their sum is 180°

Remark: **Two adjacent angles formed by a straight line and a ray with a starting point on this straight line are supplementary**

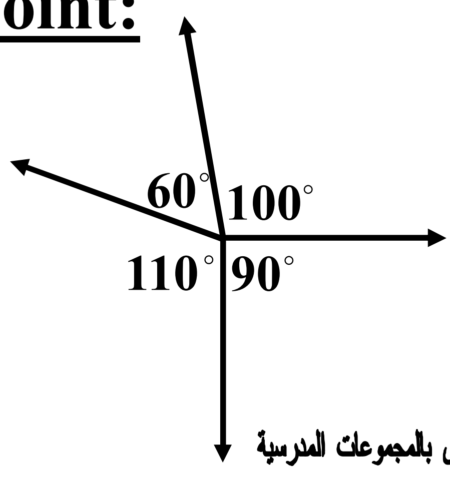
$\angle ACD$, $\angle DCB$ are adjacent angles

And they are supplementary angles



Accumulative angles at a point:

The sum of measures of the Accumulative angles At a point is 360°



The first case for congruency (S.A.S)

Two triangles are congruent if two sides and the included angle of one are congruent with the corresponding parts of the other

If in the two triangles , ABC and DEF

$$\left.\begin{array}{l}\overline{AB} \equiv \overline{DE} \\ \overline{BC} \equiv \overline{EF} \\ \angle B \equiv \angle E\end{array}\right\}$$

Then $\Delta ABC \equiv \Delta DEF$ and from congruency, we get

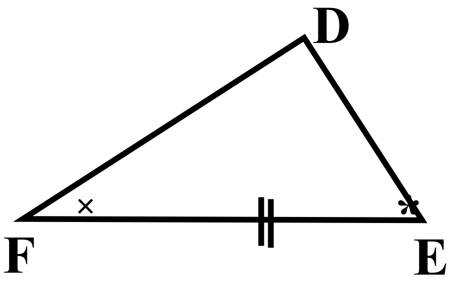
$\overline{AC} \equiv \overline{DF}, \angle A \equiv \angle D$ **and** $\angle C \equiv \angle F$

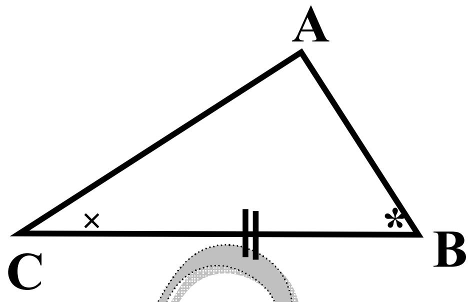
The second case for congruency (S.A.A)

If the two angles and the side drawn between their vertices of one of the two triangles are congruent to the corresponding parts of the other triangle, then the two triangles are congruent.

If in the two triangles , ABC and DEF

$$\left.\begin{array}{l}\overline{BC} \equiv \overline{EF} \\ \angle B \equiv \angle E \\ \angle C \equiv \angle F\end{array}\right\}$$



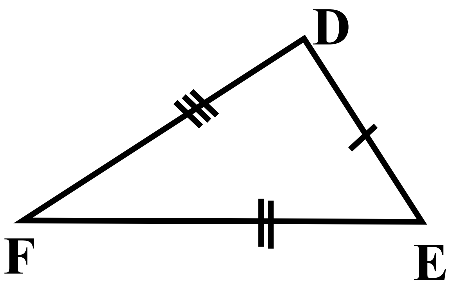


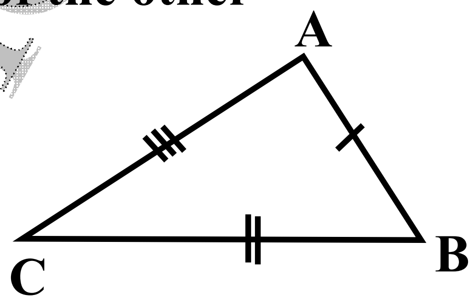
Then $\Delta ABC \equiv \Delta DEF$ and from congruency, we get

$\overline{AB} \equiv \overline{DE}$, $\overline{AC} \equiv \overline{DF}$ and $\angle A \equiv \angle D$

The third case for congruency (S.S.S)

Two triangles are congruent if each side of one triangle is congruent to its corresponding side of the other triangle.





If in the two triangles , ABC and DEF

$$\left\{ \begin{array}{l} \overline{AB} \equiv \overline{DE} \\ \overline{AC} \equiv \overline{DF} \\ \overline{BC} \equiv \overline{EF} \end{array} \right.$$

Then $\Delta ABC \equiv \Delta DEF$ and from congruency, we get

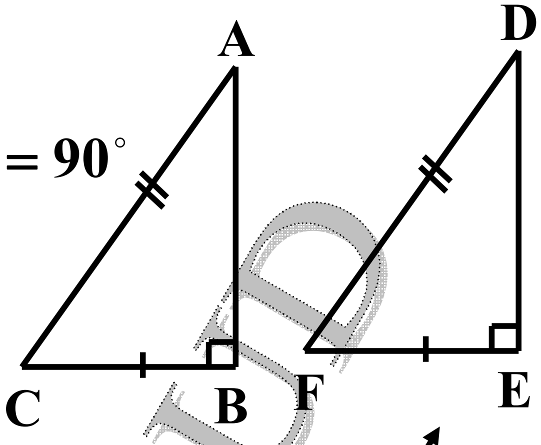
$\angle A \equiv \angle D, \angle B \equiv \angle E$ and $\angle C \equiv \angle F$

The fourth case for congruency.

Two right-angled triangles are congruent, if the hypotenuse and one side of one triangle are congruent to their corresponding parts of the other triangle.

If in the two triangles , ABC and DEF

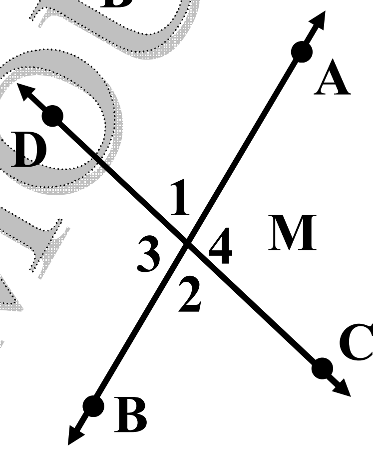
$$\left\{\begin{array}{l}\overline{AC} \equiv \overline{DF} \\ \overline{BC} \equiv \overline{EF} \\ m(\angle B) = m(\angle E) = 90^\circ\end{array}\right.$$



V.O.A.

$m(\angle 1) = m(\angle 2)$

$m(\angle 3) = m(\angle 4)$



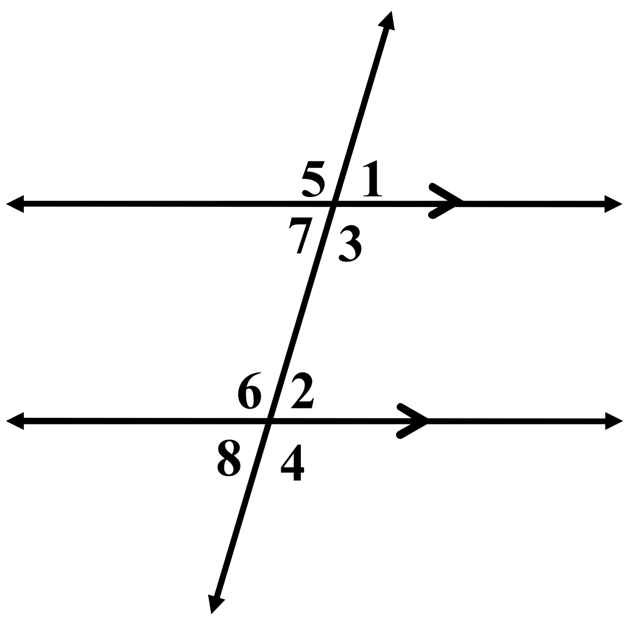
Then $\Delta ABC \equiv \Delta DEF$ and from congruency, we get $\overline{AB} \equiv \overline{DE}$, $\angle A \equiv \angle D$ and $\angle C \equiv \angle F$

Parallel straight lines:

Corresponding angles:

$m(\angle 1) = m(\angle 2)$, $m(\angle 3) = m(\angle 4)$

$m(\angle 5) = m(\angle 6)$, $m(\angle 7) = m(\angle 8)$



Alternate angles:

$m(\angle 3) = m(\angle 6)$, $m(\angle 2) = m(\angle 7)$

Interior supplementary Angles:

$m(\angle 3) + m(\angle 2) = 180^\circ$, $m(\angle 7) + m(\angle 6) = 180^\circ$

[1] Complete:

1) The sum of measures of the accumulative angles at a point = …………………..…

2) The angle whose measure is 72° complements the angle whose measure is ………………

3) If $\Delta\ ABC \equiv \Delta\ XYZ$ and $m(\angle X) = 50^o, m(\angle B) = 60^o$ then $m(\angle Z) =$ ....

4) The diagonal of the rectangle divides its surface into two …………………….. triangles.

5) The angle of measure is $\left(52\frac{2}{5}\right)^o$ is supplemented by the angle of measure ....

6) If $\Delta\ ABC \equiv \Delta\ XYZ$ and $m(\angle A) + m(\angle B) = 130^o$, then $m(\angle Z) =$ ......

7) If $m(\angle A) = 150^o$, then $m(\text{ reflex } \angle A) =$ ....

8) The two adjacent complementary angles , their terminal sides are ……………………..…..

9) If a line segment is extended from one side without limit, the produced figure is …………..

10) If $\angle A$ supplements $\angle B$, $\angle A \equiv \angle B$, then $m(\angle B) =$ ....

...

11) The measure of the straight angle = ……………

12) In the right-angled triangle , the area of the square set up the hypotenuse equals ……………………………

…………………………………………………………………

13) If one of the two supplement angles is acute then the other is …………………… angle.

14) The two triangles are congruent if two sides and ……………………………... in one of them are

congruent to their corresponding elements in the other.

15) If $m(\angle A) = 170^\circ$, then $m(\text{reflex} \angle A) = ...$

16) …….. < the measure of the obtuse angle < ……..

17) If Δ XYZ is right-angled at X, XY = 12 cm , XZ = 9 cm. then $(YZ)^2 = ...cm^2$.

18) The required condition for the two straight lines are parallel is ………………………

19) If $\Delta ABC \equiv \Delta XYZ$ then $BC = ...$

20) If $\angle A$ supplements $\angle B$, and $m(\angle A) = 2\, m(\angle B)$, then $m(\angle B) = ...$

21) The angle of measure is $89^\circ 60'$ is ....angle.

22) The number of edges which are parallel to one edge of a cube is ……

23) If $\overline{AB} \equiv \overline{XY}$, then $AB - XY = ...$

24) The sum of measures of the two complementary angles = ……………………..….

25) The angle of measure is x° complements the angle of measure is ……………………..

26) If ABC is a triangle in which $AB = 5$ cm, $BC = 12$ cm and $AC = 13$ cm then $m(\angle........) = 90^\circ$

27) The two right-angled triangles are congruent if ….. in one of them are congruent with their corresponding elements in the other triangle.

28) The angle whose measure $47^\circ 30^\backslash$ is complemented the angle whose measure..............................

29) The sum of measures of the two supplementary angles equals …………………..…

30) If $m(\angle X) = \frac{1}{2} m(\angle Y)$ and $m(\angle X) = 30^\circ$, then the two angles X and Y are......

31) In the right-angled triangle , the area of the square set up the hypotenuse equals ………………...

32) The two straight lines which are parallel to a third straight line are ………………….

33) $\textbf{If } m(\angle X) = 2m(\angle Y) \textbf{ and } Y \textbf{ is obtuse angle, then } \angle X \textbf{ is .....}$

34) $\textbf{If } \Delta\, ABC \equiv \Delta\, XYZ \textbf{ and } m(\angle X) + m(\angle Z) = 140^\circ,$
$\textbf{then } m(\angle B) = ...$

35) The two adjacent angles formed by intersecting a straight line and a ray whose start point lies on the straight line are ………………….

36) $\textbf{In } \Delta\, ABC: \textbf{if } (AB)^2 - (BC)^2 = (AC)^2,$
$\textbf{then } m(\angle .....) = 90^\circ$

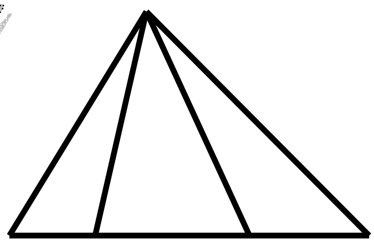
37) $\textbf{If } m(\angle A) = 50^\circ, \angle A \textbf{ complements } \angle B, \angle B \textbf{ supplements }$
$\angle C, \textbf{then } m(\angle C) = ...$

38) A rectangle of length 4 cm. and width 3 cm , then the area of the square set its diagonal equals …… cm^2

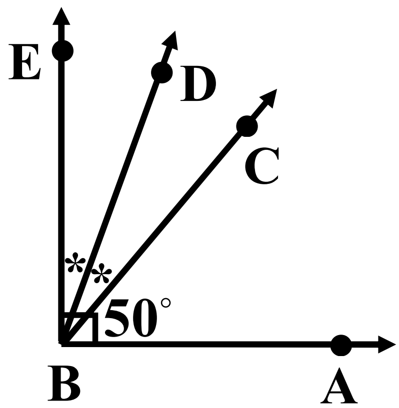
39) If the lengths of the two sides of the right angle in the right - angled triangle are 5 cm. and 6 cm. then the area of the square set up the hypotenuse = ...cm^2

40) If $m(\angle X) = \frac{1}{2} m(\angle Y)$ and $m(\angle X) = 60^\circ$, then the two angles X and Y are ....

41) The number of triangles in the opposite figure is …………



42) In the opposite figure:

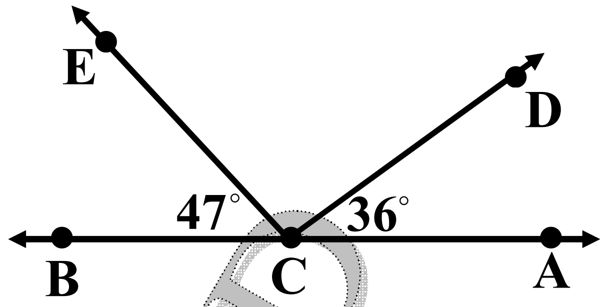


If $m(\angle ABC) = 50^\circ$, $\overrightarrow{BD}$ bisects $\angle CBE$

$\overrightarrow{BD} \perp \overrightarrow{BE}$, then $m(\angle CBD) =$ ....

43) In the opposite figure:

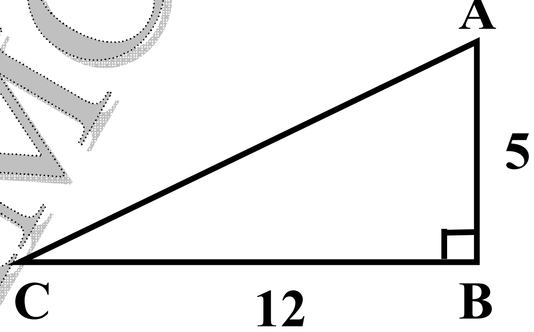
m(∠DCE)= ....



44) In the opposite figure:

ABC is a right-angled triangle

at B then $(AC)^2$ = ….. cm^2.



45) In the opposite figure:

If Δ ABC is

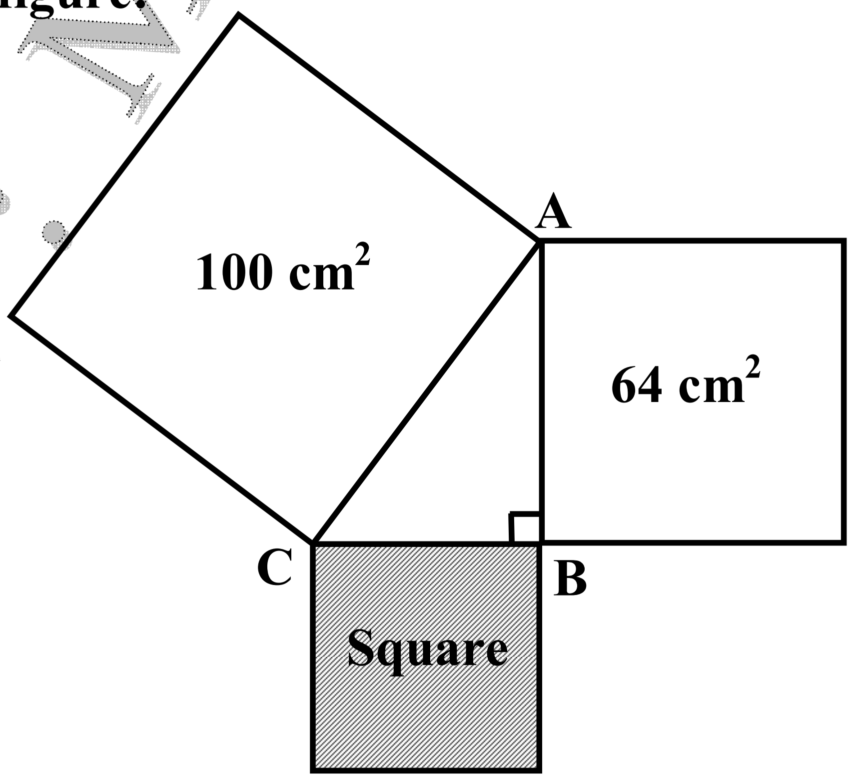
right-angled

at B then the

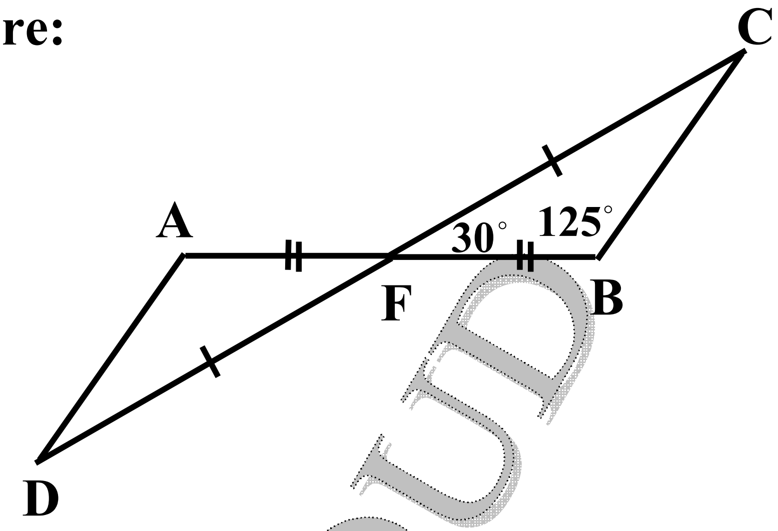
area of the

shaded square

equals ….. cm^2.



46) In the opposite figure:



If $\overline{AB} \cap \overline{CD} = \{F\}$

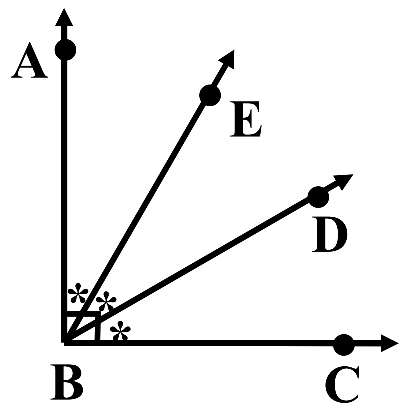
$FC = FD, FA = FB$

$m(\angle CFB) = 30^\circ$

and $m(\angle B) = 125^\circ$

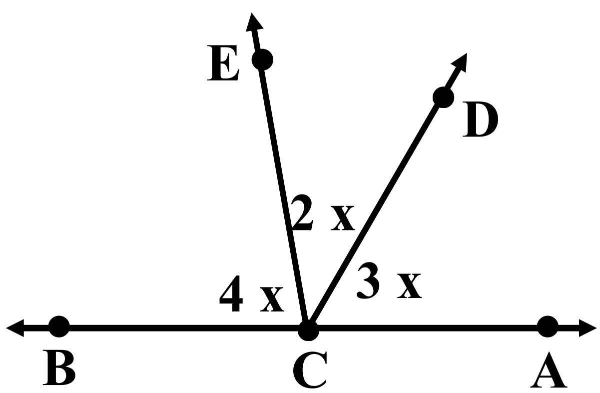
then $m(\angle D) = ...$

47) In the opposite figure:



If $\overrightarrow{BA} \perp \overrightarrow{BC}$, then $m(\angle CBE) = ...$

48) In the opposite figure:

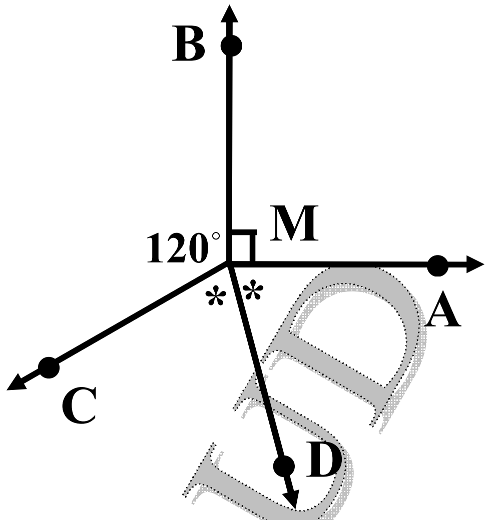


If $A \in \overleftrightarrow{BC}$, then $x = ...$

49) In the opposite figure:

$\overrightarrow{MD}$ bisects $\angle AMC$,

then $m(\angle AMD) = ...$

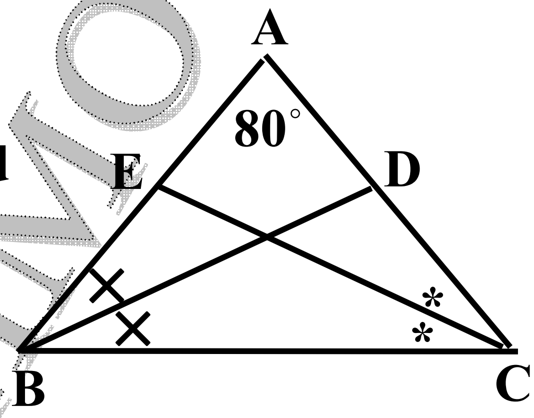


50) In the opposite figure:

$m(\angle A) = 80^\circ$, $\overrightarrow{BD}$ bisects $\angle B$ and

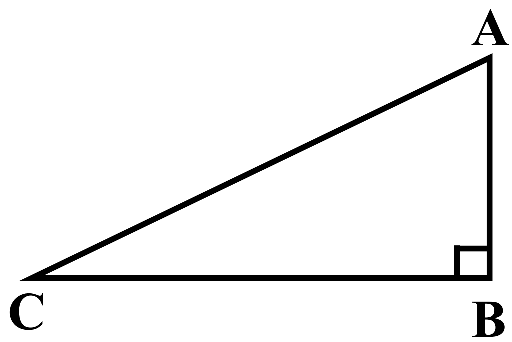
$\overrightarrow{CE}$ bisects $\angle C$,

then $m(\angle CFB) = ...$



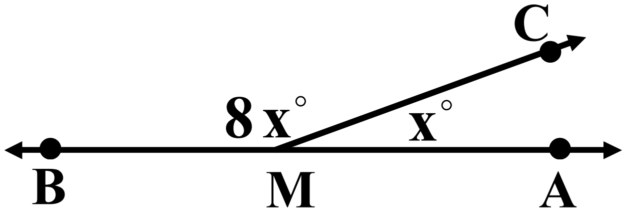
51) The hypotenuse in the

opposite triangle is ……..

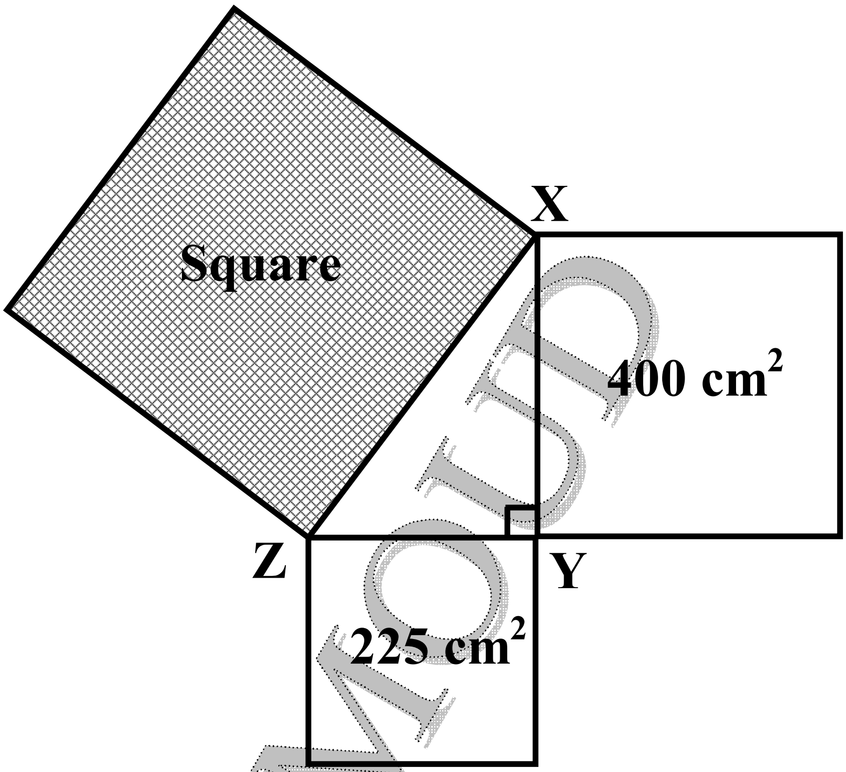


52) In the opposite figure:

If $M \in \overleftrightarrow{AB}$, then $x = ...$



53) If Δ XYZ is right-angled triangle at Y, then the area of shaded square $= ......cm^2$



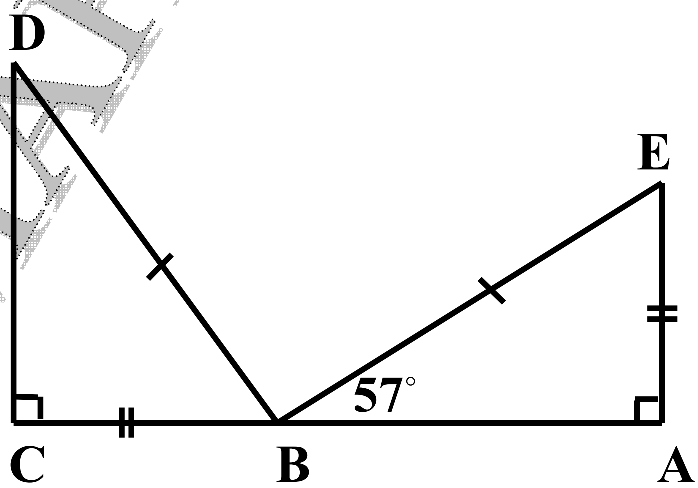
54) In the opposite figure:

$B \in \overleftrightarrow{AC}$, AE = BC

BE = BD, $m(\angle A) = m(\angle C) = 90^\circ$,

$m(\angle EBA) = 57^\circ$

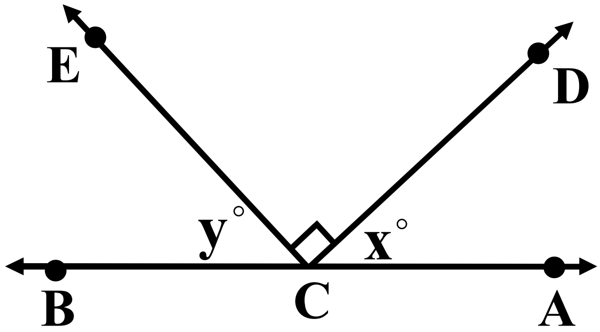
then $m(\angle EBD) = ...$



55) In the opposite figure:

If $C \in \overleftrightarrow{AB}$

then $x^\circ + y^\circ = ...$

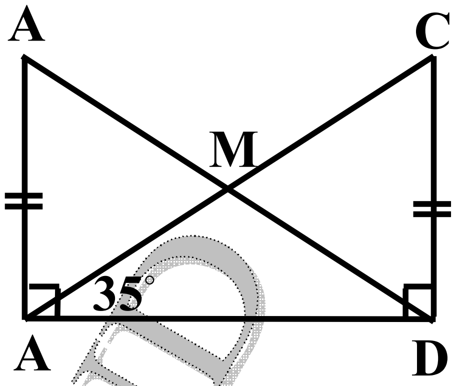


56) In the opposite figure:

If $AB = CD$, $m(\angle CBD) = 35^\circ$

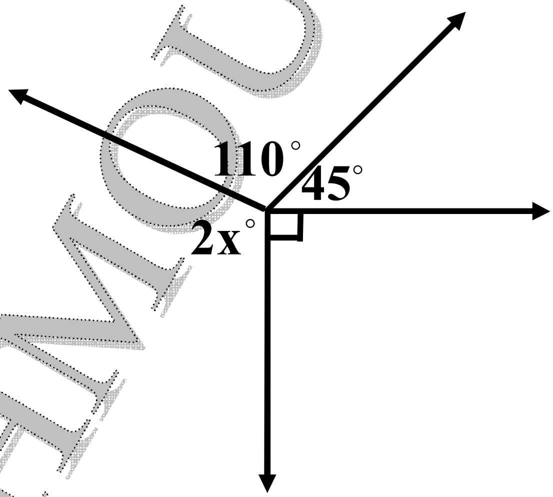
$\overline{AB} \perp \overline{DB}$ and $\overline{CD} \perp \overline{DB}$

then $m(\angle DMB) = ...$



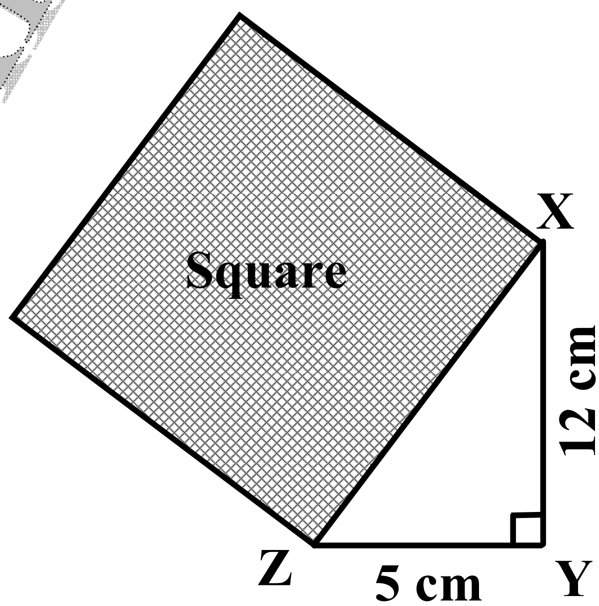
57) In the opposite figure:

$x = ...$



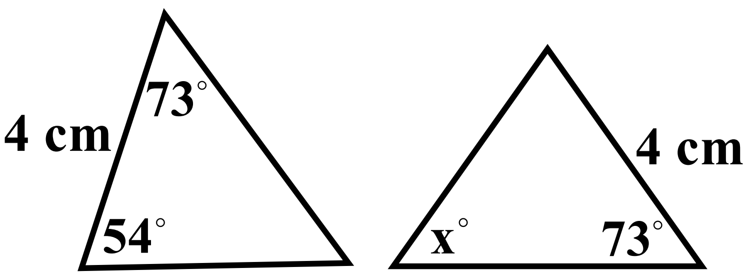
58) In the opposite figure:

The area of the shaded square = .….cm^2.

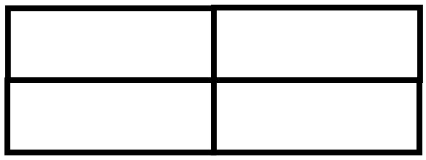


59) In the opposite figure:

If the two triaqngles are congruent then x = ….

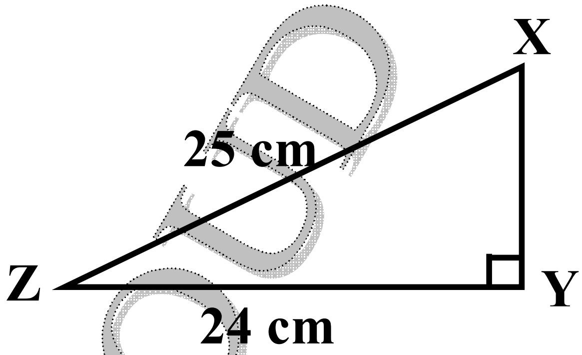


60) The number of rectangles in the opposite figure = …..



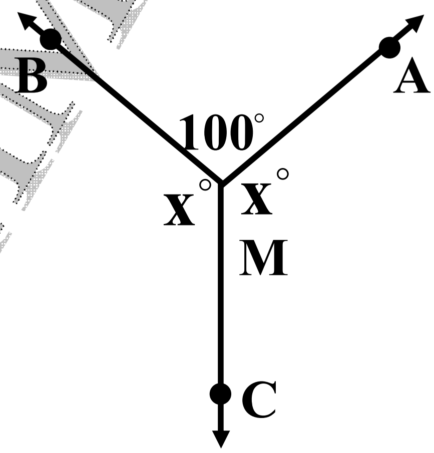
61) In the opposite figure:

If XYZ is a right-angled triangle at Y then $(XY)^2 = \ldots\ldots \text{ cm}^2$.



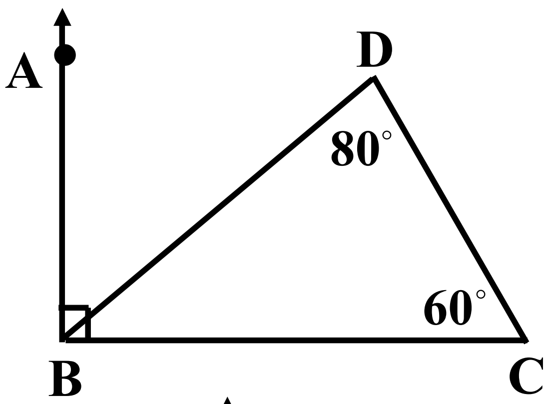
62) In the opposite figure:

If $m(\angle AMB) = 100^\circ$, then $x = \ldots..$

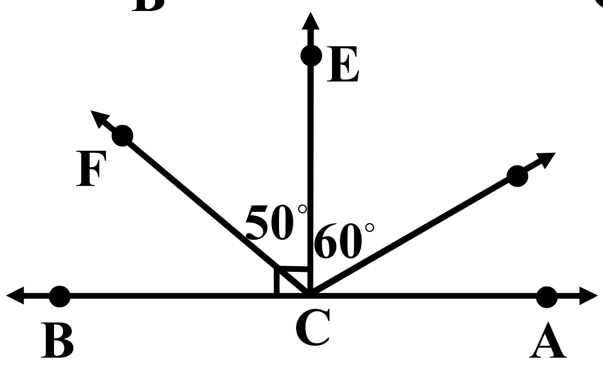


63) In the opposite figure:

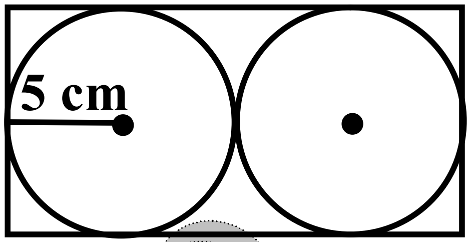
If $\overrightarrow{BA} \perp \overrightarrow{BC}$, then $m(\angle ABD) = \ldots\ldots.$



64) The number of obtuse angle in the opposite Figure is ……..

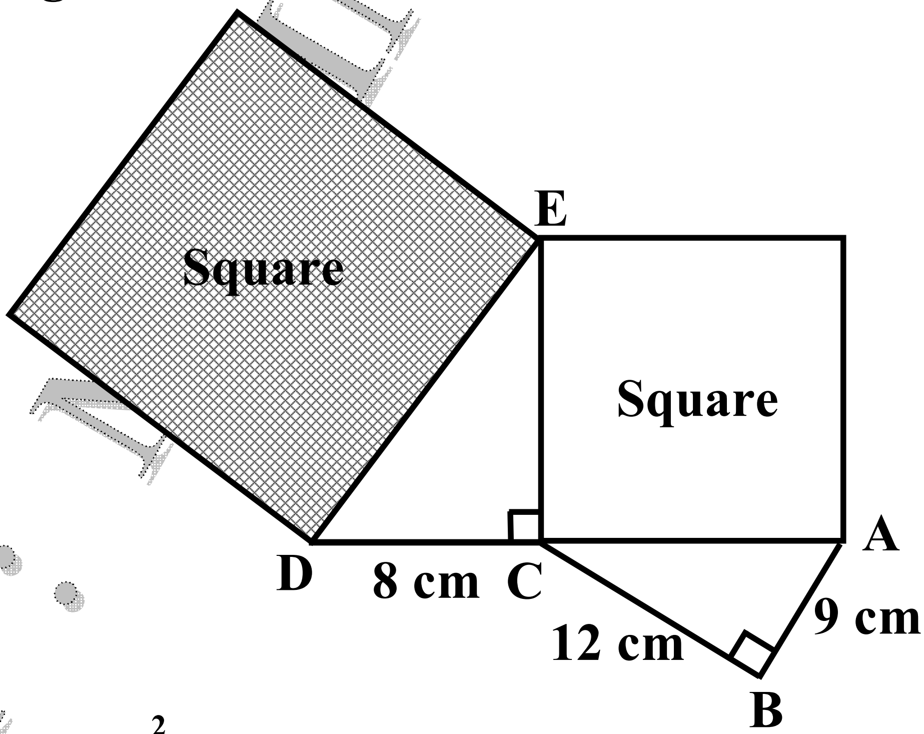


65) In the opposite figure:



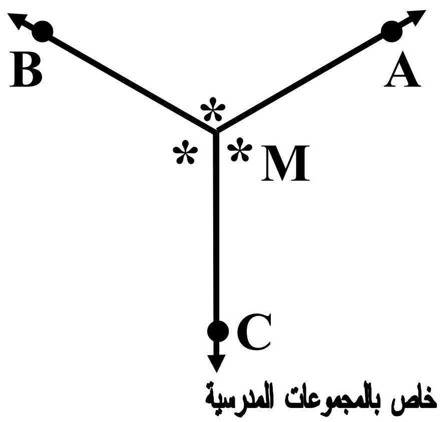
Two circles are drawn inside a rectangle M and N each of them is of radius 5 cm long , then the area of rectangle = …… cm^2 .

66) In the opposite figure:



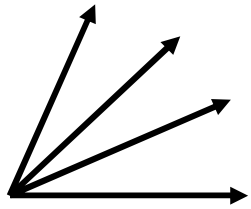
If Δ ABC is right-angled at B and Δ ECD is Right-angled at C , then the area of the shaded square = ... cm^2.

67) In the opposite figure:



m(∠AMC) = ...°

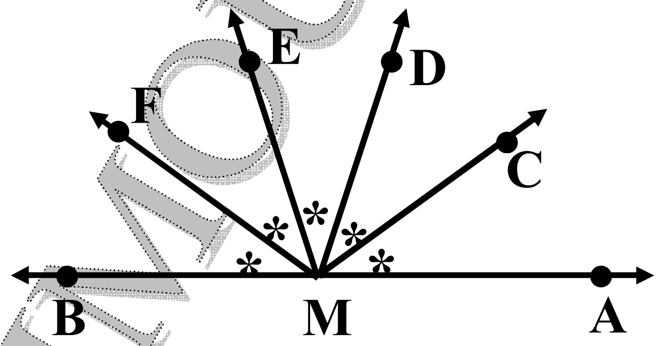
68) In the opposite figure:



The number of the acute angles

in the opposite figure is ……

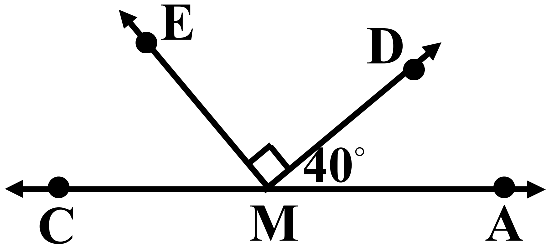
69) In the opposite figure:



If $M \in \overleftrightarrow{AB}$, then

m(∠AMC)= ....

70) In the opposite figure:

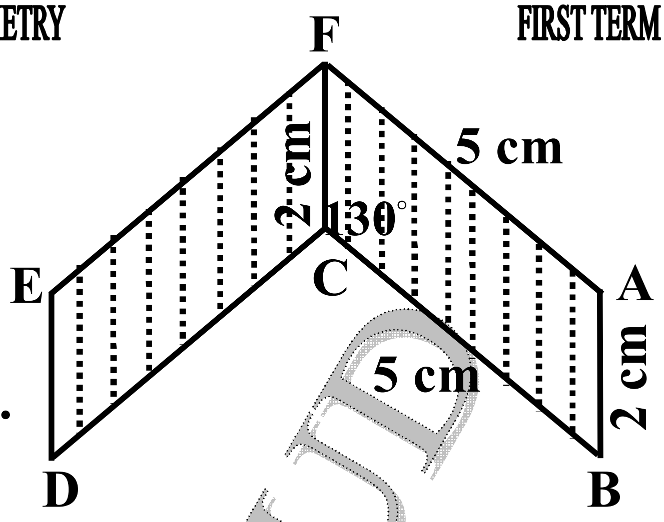


If $M \in \overleftrightarrow{AC}$, then

m(∠EMC)= ....

71) In the opposite figure:

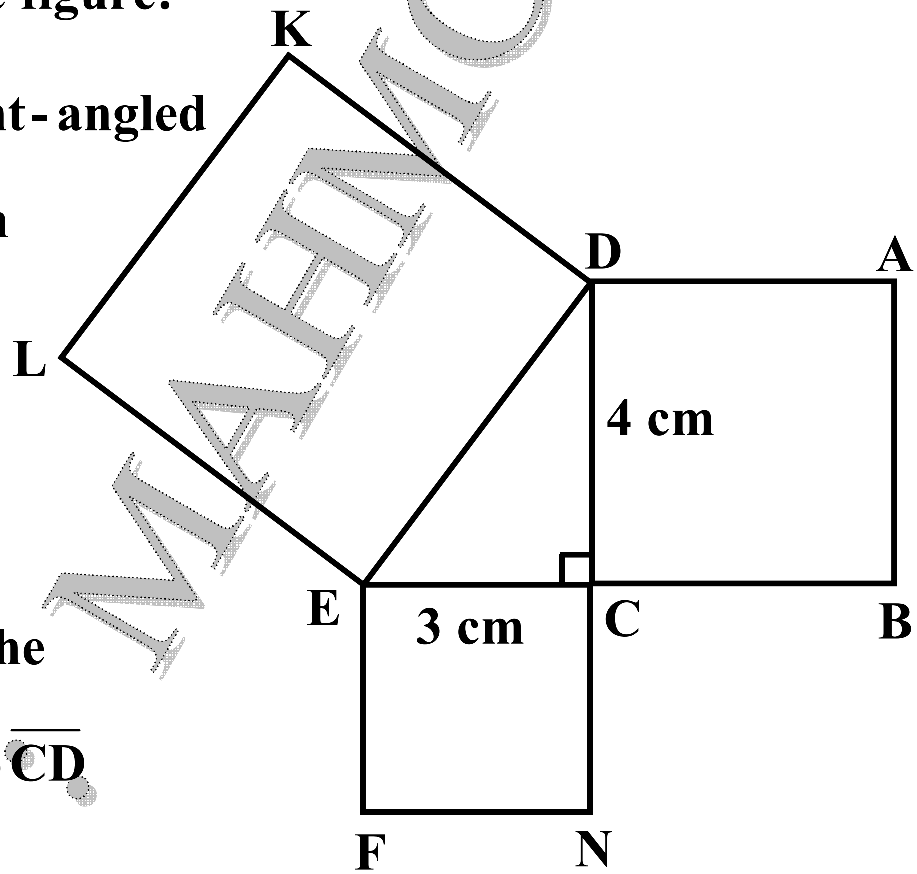
If the figure ABCF ≡ the figure EDCF, then



a) The perimeter of the shaded figure = ...cm.

b) m(∠BCD) = ...

72) In the opposite figure:



If △CDE is right - angled at C, CD = 4 cm CE = 3 cm.

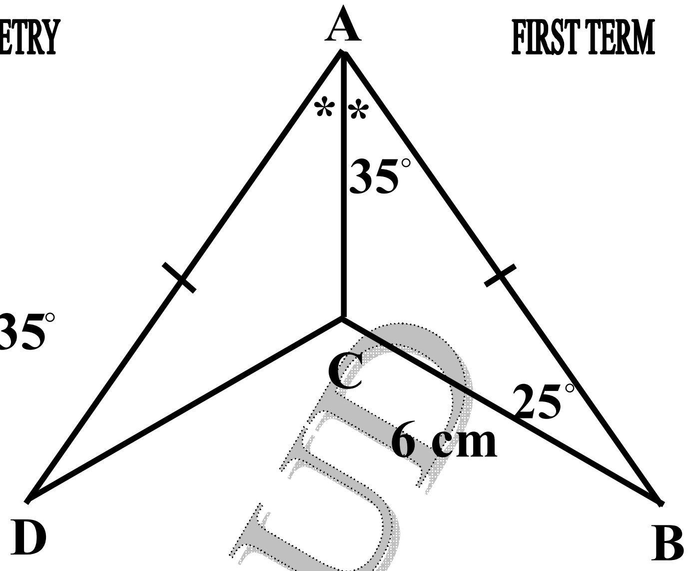
Complete the following

a) The area of the square set up $\overline{CD}$ = ... cm^2.

b) The area of the square set up $\overline{DE}$ = ...cm^2.

c) The area of all figure = ... cm^2.

73) In the opposite figure:



If $AB = AD$, $BC = 6$ cm.

$m(\angle BAC) = m(\angle DAC) = 35^\circ$

$m(\angle B) = 25^\circ$ Complete the following:

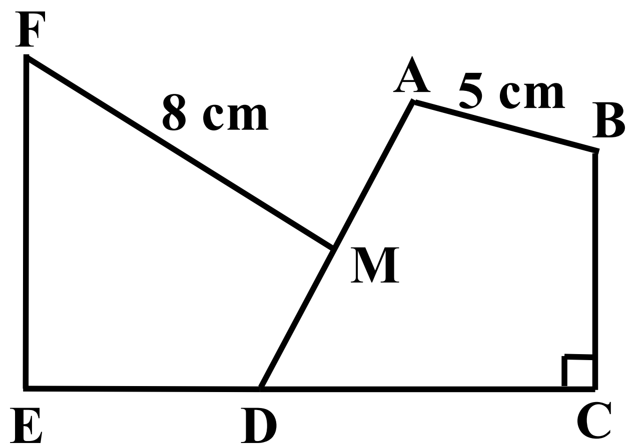
a) Δ ACB $\equiv$ ....　　b) $m(\angle D) =$ ....

c) CD = ...cm　　d) $m(\angle ACD) =$ ....

74) In the opposite figure:

If $D \in \overleftrightarrow{CE}$, $\overline{BC} \perp \overline{CD}$

the figure ABCD $\equiv$ the figure MDEF complete the following:



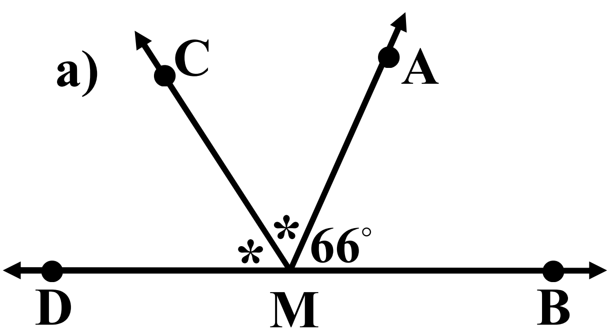
a) $m(\angle B) = m(\angle ....)$

b) $m(\angle B) + m(\angle F) =$ .....

c) AM = ...cm.

75) Find the measure of the required angle under each figure:

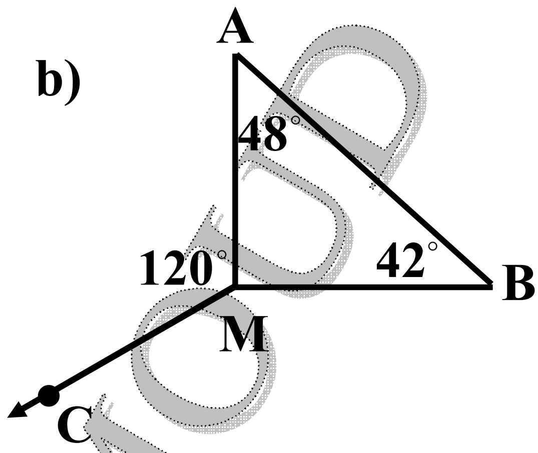
a)



If $M \in \overleftrightarrow{BD}$, $\overrightarrow{MC}$ bisects $\angle AMD$, then

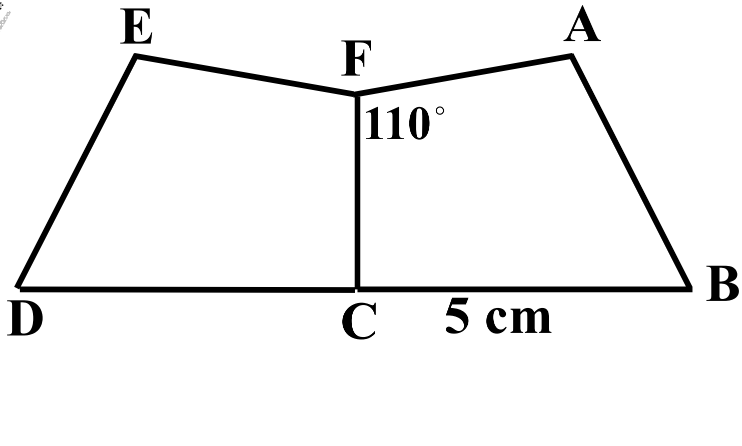
$m(\angle AMC) = ...$

b)



$m(\angle BMC) = ...$

76) In the opposite figure:



If $C \in \overleftrightarrow{BD}$,

$m(\angle AFC) = 110^\circ$

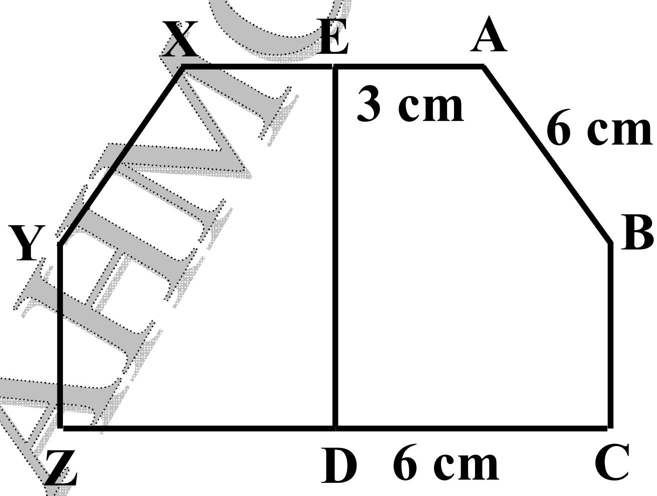
BC = 5 cm. and the polygon ABCF ≡ the polygon EDCF

Complete the following :

a) $\overline{CF}$ is .... side. **b) BD = ... cm.**

c) m($\angle$FCD) = ... **d) m($\angle$AFE) = ...**

77) In the opposite figure:



If D $\in \overleftrightarrow{CZ}$, the figure ABCDE $\equiv$ the figure XYZDE, AE = 3 cm BC = 4 cm and AB = CD = 6 cm.

Complete the following:

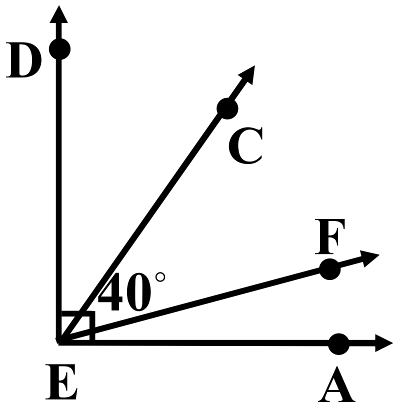
a) XY = ... cm. **b) YZ = ...cm.**

c) m($\angle$EDC) = ... **d) CZ = ...cm.**

e) The perimeter of the figure ABCZYX = ...cm.

78) Find the measure of the required angle under each figure:

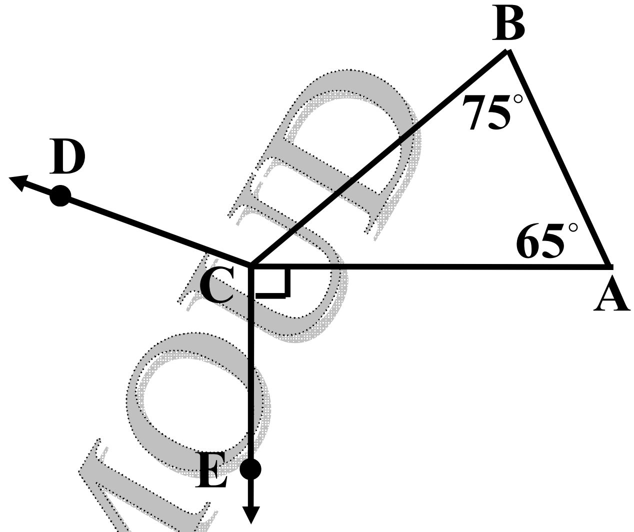
a)



If $\overrightarrow{EA} \perp \overrightarrow{ED}$

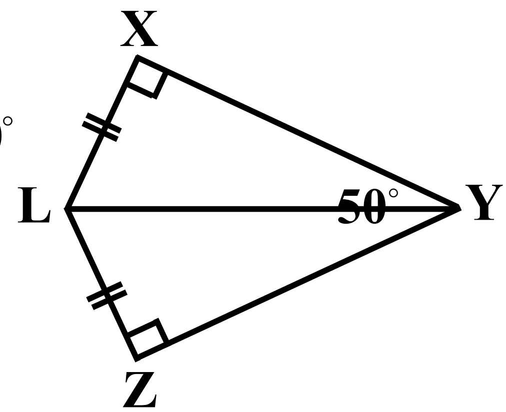
then $m(\angle AEF) = ...$

b)



$m(\angle ECD) = ...$

79) In the opposite figure:



If $LZ = LX$, $m(\angle Z) = m(\angle X) = 90^\circ$

and $m(\angle XYZ) = 50^\circ$

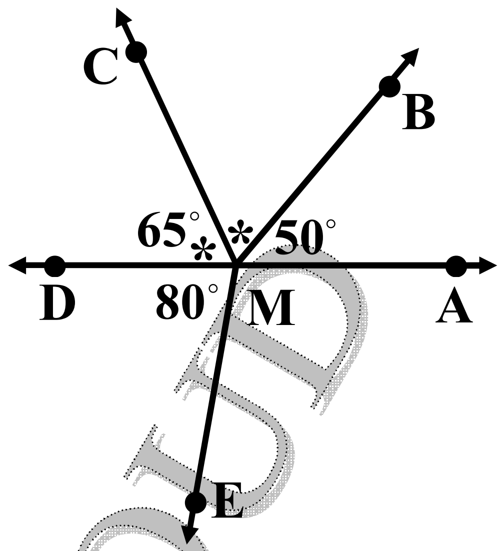
Complete the following:

a) Δ XYL $\equiv \Delta$ .....

b) YZ = ...

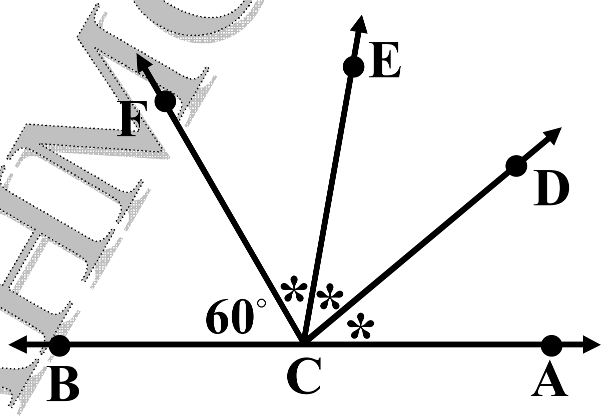
c) $m(\angle XLY) = m(\angle ....) = ...$

80) Find the measure of the required angle:



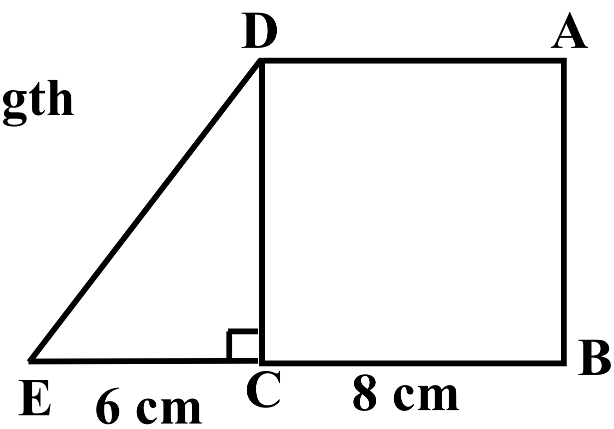
If $\overrightarrow{MC}$ bisects $\angle BMD$ then $m(\angle AME) = ...$

81) Find the measure of the required angle:



If $C \in \overleftrightarrow{AB}$ then $m(\angle DCB) = ...$

82) In the opposite figure:



ABCD is a square of side length 8 cm. and $E \in \overrightarrow{BC}$ such that $CE = 6$ cm.

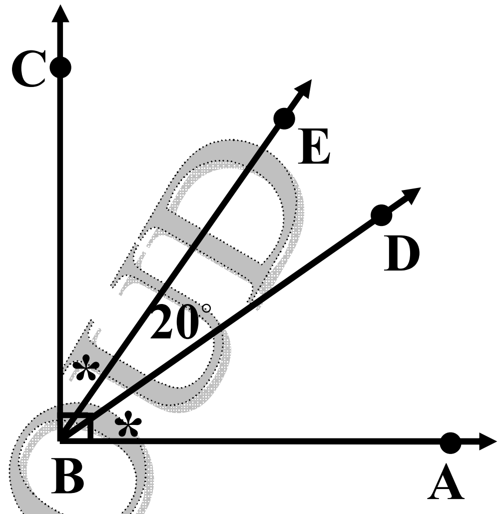
a) The area of Δ DCE $= ....cm^2$.

b) The area of the square set up $\overline{DE} = ...cm^2$.

83) Find the measure of the required angle:

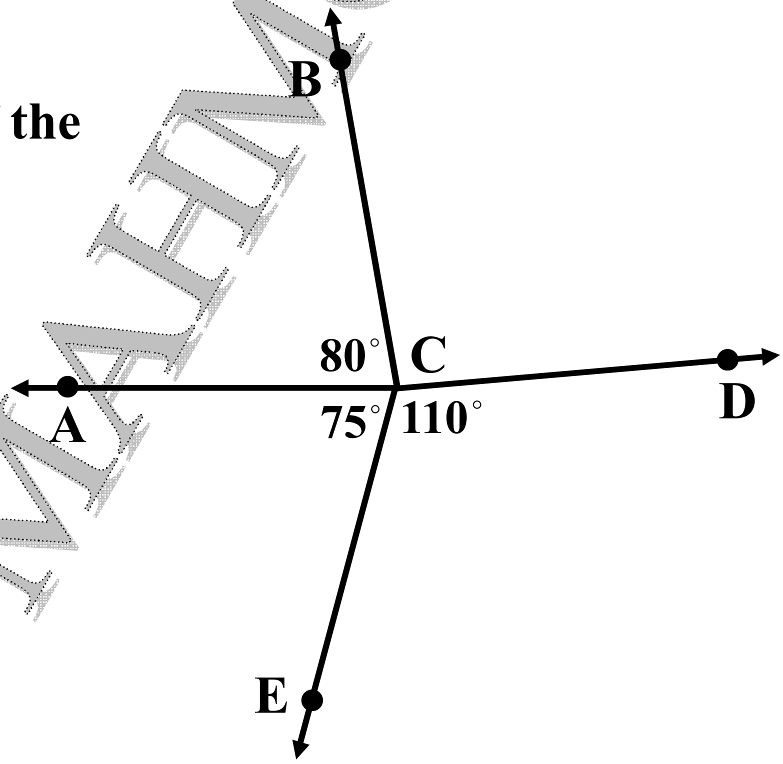
If $\overrightarrow{BA} \perp \overrightarrow{BC}$

then $m(\angle ABD) = ...$



84) Find the measure of the required angle

$m(\angle BCD) = ...$



[2]

1) In the opposite figure:

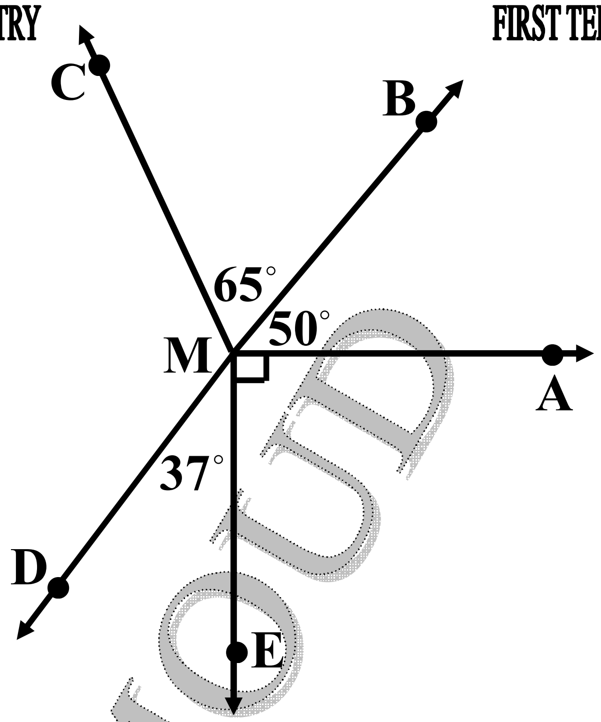
If $m(\angle AMB) = 50^\circ$

$m(\angle BMC) = 65^\circ$

$m(\angle EMD) = 37^\circ$

and $\overrightarrow{MA} \perp \overrightarrow{ME}$

Find : $m(\angle CMD)$



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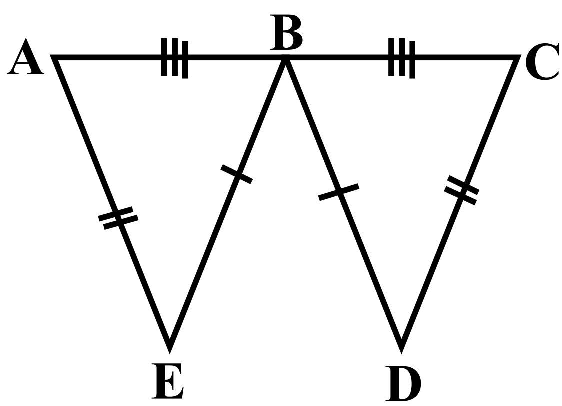
2) In each of the following figures show if the two triangles are congruent or not. If they are congruent name the case of congruency and state the results obtained. If they are not give reasons given that the similar signs denote to congruence of the labeled elements by them.

a)



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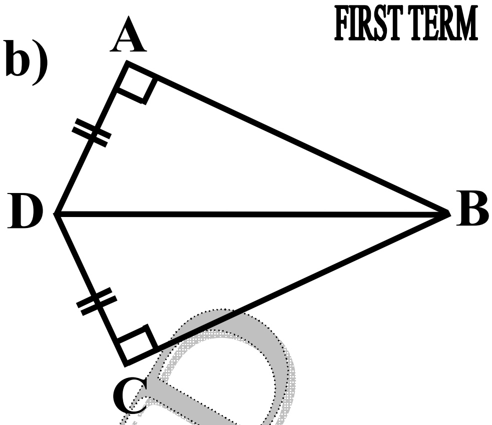
b)



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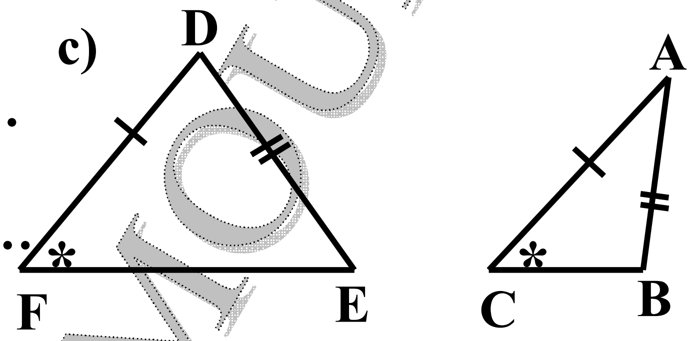
c)



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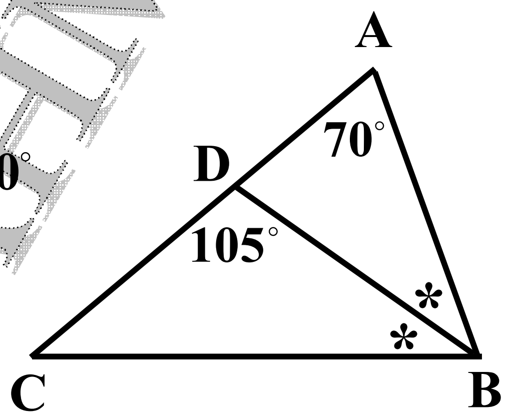
3) In the opposite figure:

$\overrightarrow{BD}$ bisects $\angle ABC$, $m(\angle A) = 70^\circ$

and $m(\angle CBD) = 105^\circ$

Find : $m(\angle C)$



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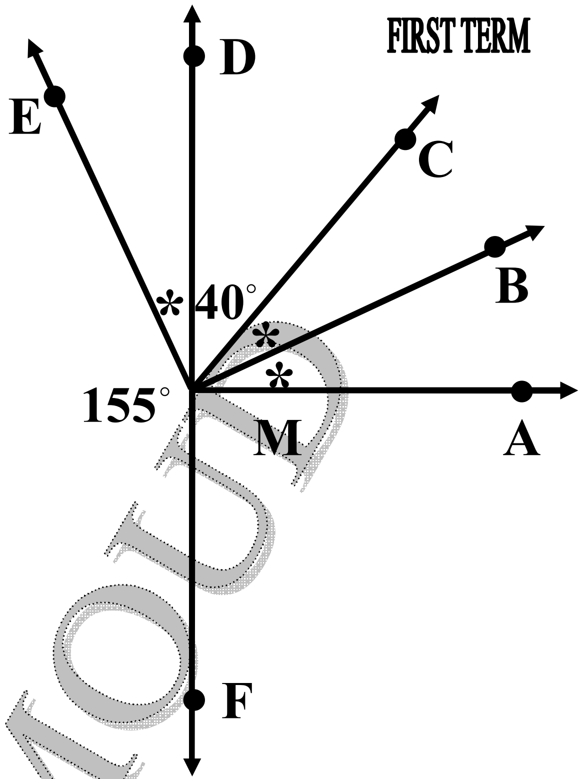
4) In the opposite figure:

If $m(\angle AMB) = m(\angle BMC) = m(\angle DME)$, $\overrightarrow{MA} \perp \overrightarrow{MF}$

$m(\angle EMF) = 155^\circ$ and $m(\angle CMD) = 40^\circ$. find: $m(\angle AMB)$



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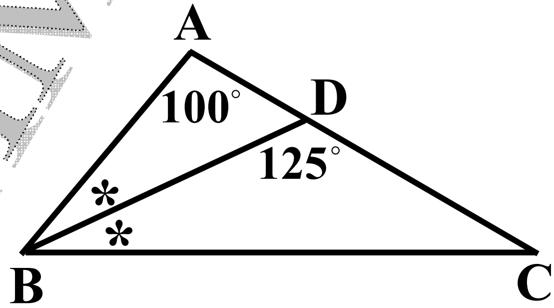
5) In the opposite figure:



$\overrightarrow{BD}$ bisects $\angle CBA$

$m(\angle CDB) = 125^\circ$

$m(\angle A) = 100^\circ$

Find : $m(\angle C)$

……………………………………………………………………………………

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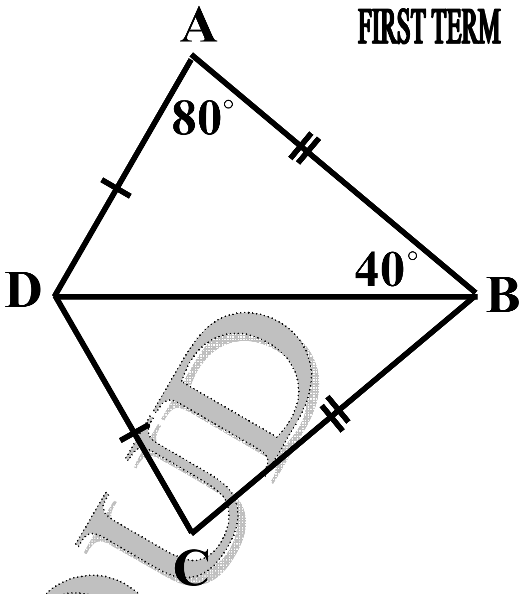
6) In the opposite figure:

$AB = BC$, $DA = DC$, $m(\angle ABD) = 40^\circ$,

$m(\angle BAD) = 80^\circ$ find: $m(\angle ADC)$



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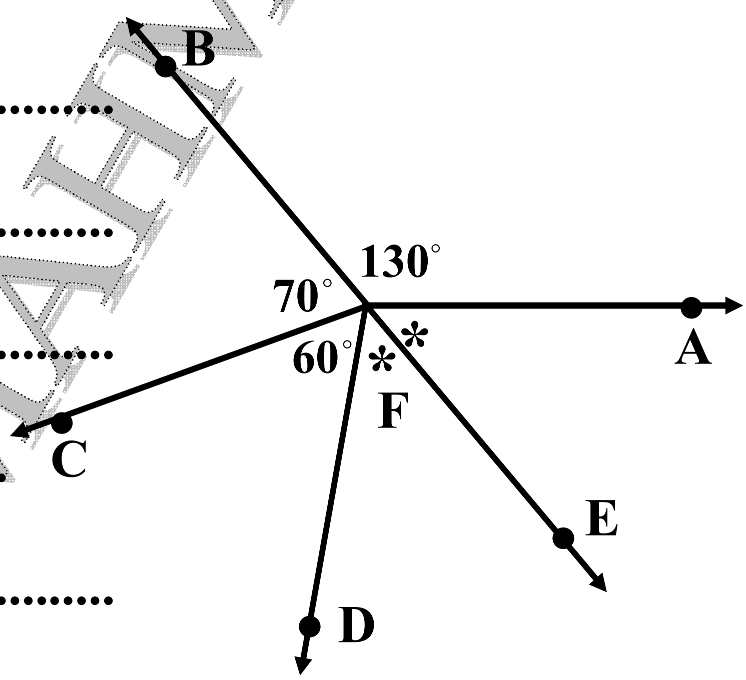
7) In the opposite figure:

If $\overrightarrow{FE}$ bisects $\angle AFD$, find $m(\angle AFE)$



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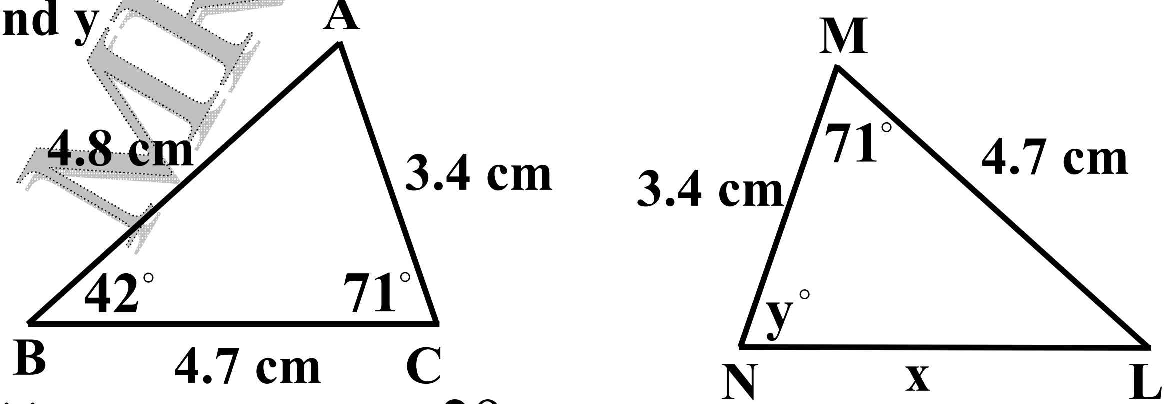
8) Study the following two figures, then find the value of x and y



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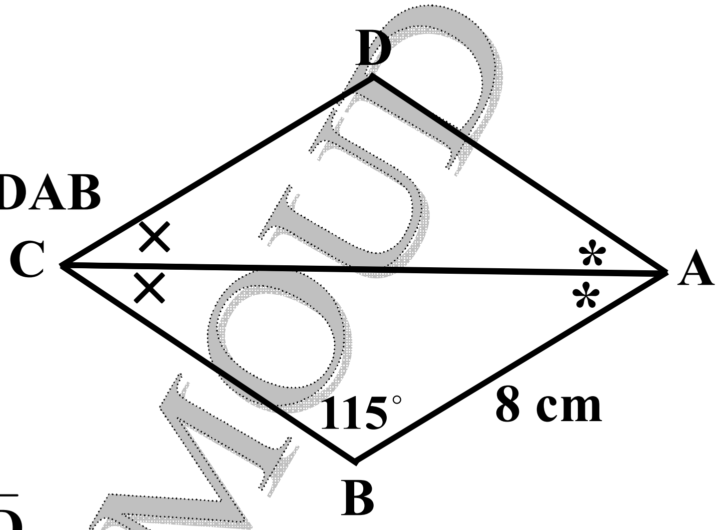
9) In the opposite figure:



$\overleftrightarrow{AC}$ bisects $\angle DCB$ and $\angle DAB$

$m(\angle B) = 115^\circ$ and

$AB = 8$ cm.

Find : a) $m(\angle D)$

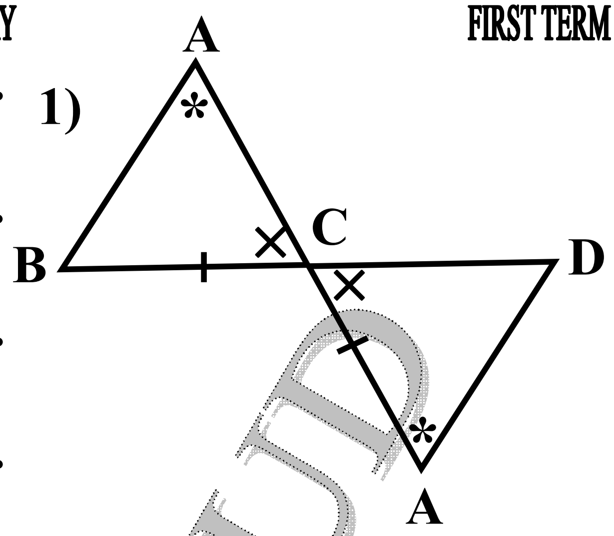
b) The length of $\overline{AD}$

……………………………………………………………………………

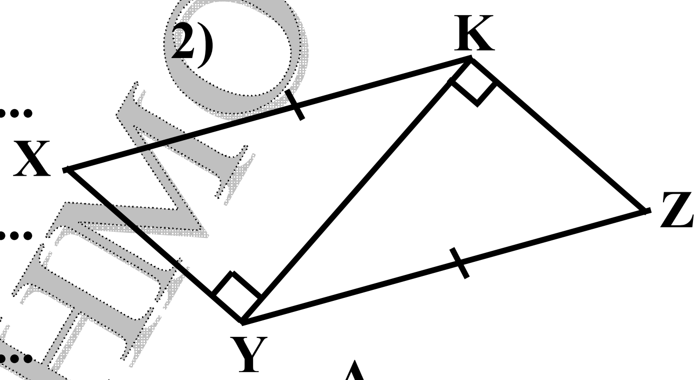
……………………………………………………………………………

10) In each of the following figures show if the two triangles are congruent or not. If they are congruent name the case of congruency and the results of the congruency and if they are not congruent give the reason. (given that : the similar signs denote to congruency of labeled elements by these signs)

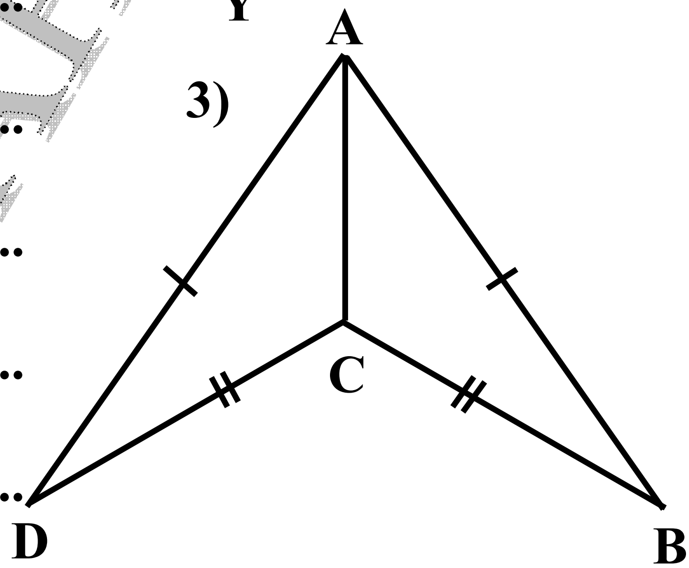
1)



2)



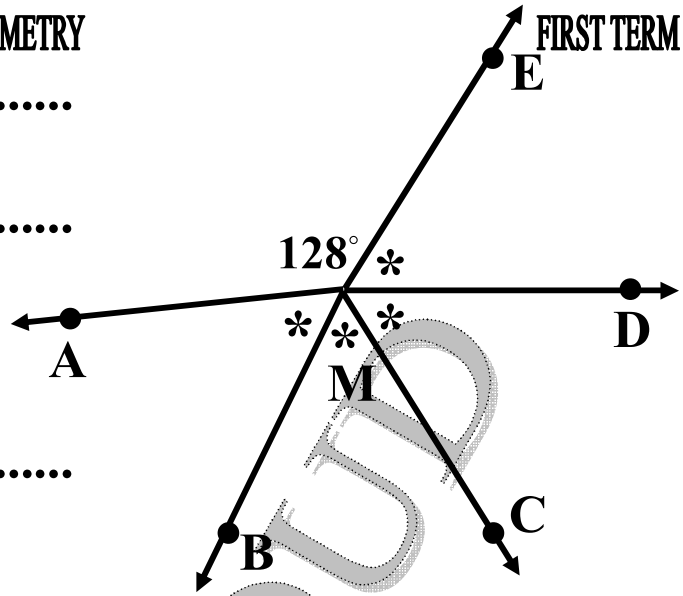
3)



11) In the opposite figure:

If $m(\angle AMB) = m(\angle BMC) = m(\angle CMD) = m(\angle DME)$

and $m(\angle EMA) = 128^\circ$. find : $m(\angle BMC)$



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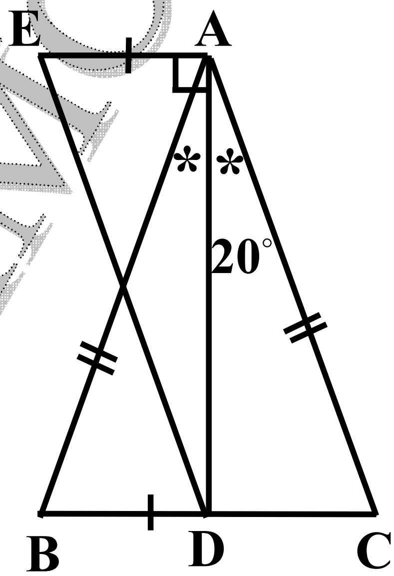
12) In the opposite figure:

$AC = AB,\ AE = DB,\ \overrightarrow{AD}$
is the bisector of $\angle CAB$ and
$\overline{DA} \perp \overline{AE}$
Find: $m(\angle AED)$



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13) In the opposite figure:

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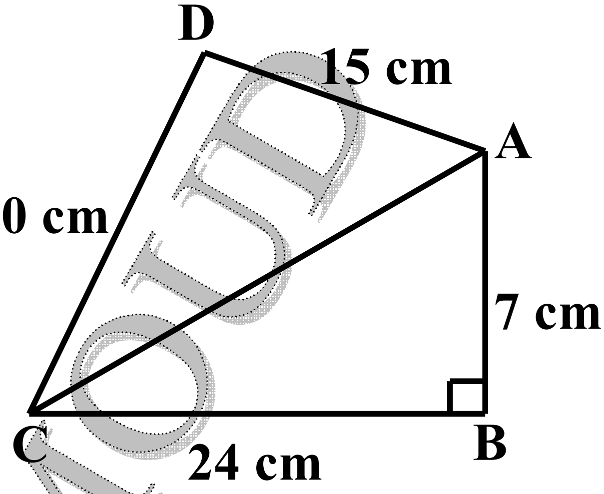
If $m(\angle ABC) = 90^\circ$, $AB = 7$ cm , $BC = 24$ cm

$CD = 20$ cm. and $DA = 15$ cm.

a) Is $m(\angle ADC) = 90^\circ$?

Why?

b) Find the area of the whole figure.



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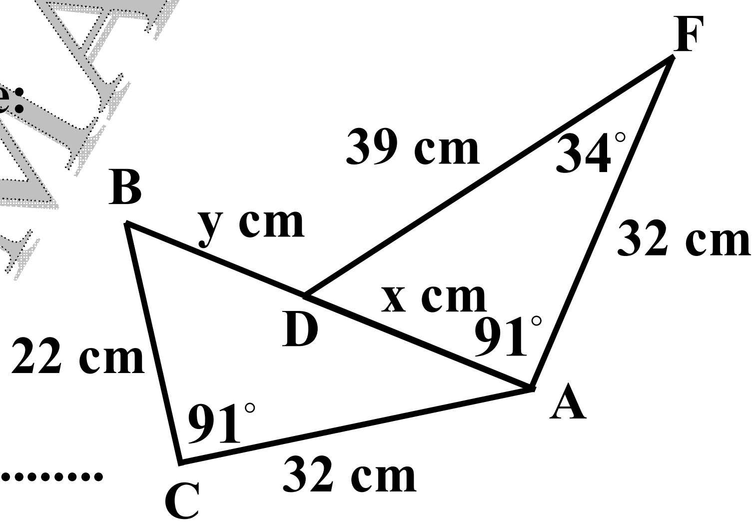
14) In the opposite figure:

Find the value of x and y



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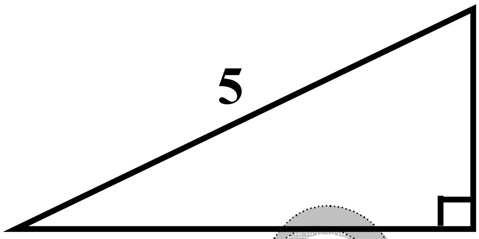
[3] Choose:

1) In the opposite figure:

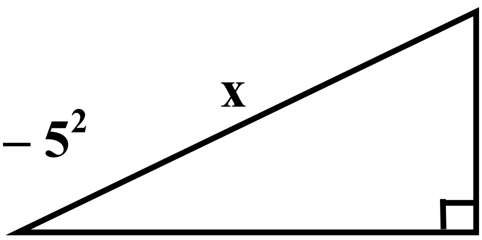


Which of the following represents a true statement?

a) $x^2 + (x - 1)^2 = 25$ b) $x + (x - 1) = 25$

c) $x^2 - x = 12$ d) $(x - 1)^2 - x^2 = 25$

2) Which of the following represents a correct statement?



a) $x = 5^2 + 12$ b) $x^2 = 12^2 - 5^2$

c) $x + 25 = 144$ d) $x^2 = 169$

[4]

1) Using the ruler and compasses. Draw Δ ABC in which AB = AC = 7 cm. and BC = 6 cm. then bisect each of $\angle$B and $\angle$C by two bisectors intersecting at M
Is MB = MC ? (Don't remove arcs)

2) State three cases of congruency of two triangles.

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3) If Δ ABC in which AB = 60 cm , AC = 61 , BC = 11 cm is Δ ABC right - angled or not ? then if it is right - angled determine the right - angle.

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4) In Δ ABC : AB = 7 cm. , AC = 25 cm and BC = 24 cm. is Δ ABC is right - angled or not ? then determine the right angle if exist.

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5) Using the geometric instruments draw an angle of measure 130° then divide it into 4 equal angles in measure

6) Put (✓) or (✗):-

a) Each two equal triangles in perimeter are congruent.

b) The two right-angled triangles are congruent if two sides in one of them are equal to their corresponding sides in the other

7) Draw Δ ABC in which AB = AC = 5 cm. and BC = 6 cm. then draw $\overline{AD} \perp \overline{BC}$ where $\overline{AD} \cap \overline{BC} = \{D\}$, then find by measure the length of $\overline{AD}$

8) A ladder of length 10 metre leans on a horizontal ground and a vertical wall if its upper end is over the ground by 8 metre find the square of the distance between its lower end and the wall. Show your work.

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9) LMN is a triangle in which LM = 20 cm , MN = 21 cm and LN = 29 cm show if Δ LMN is a right - angled or not. determine the right angle if it exists.

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10) Using the geometric tools to draw the equilateral triangle ABC whose side length = 4 cm. then draw $\overline{AD} \perp \overline{BC}$ where $\overrightarrow{AD} \cap \overline{BC} = \{D\}$

11) Using the geometric tools to draw Δ ABC in which AB = 3 cm , BC = 4 cm , AC = 5 cm , then bisect $\angle B$ by $\overrightarrow{BD}$ which cuts $\overline{AC}$ at D and find by measure the length of $\overline{BD}$

12) Put (✓) or (✗):-

a) Each two congruent triangles are equal in area.

b) The two triangles are congruent if the measures of the angles of one of them are equal to its corresponding measures of the angles in the other two sides.

c) The area of the square set up a side of the right angle in the right-angled triangle equals the sum of the areas of the two squares set up the other two sides.

13) Draw Δ ABC which is an equilateral and its side length = 5 cm. long then bisect $\angle A$, $\angle B$ and $\angle C$ by three bisectors intersecting at M is MA = MB = MC ?

14) Draw Δ ABC in which AB = 7 cm , m($\angle A$) = 50° and m($\angle B$) = 70° , then draw $\overline{CD} \perp \overline{AB}$ and cut it at D , then find by measure the length of $\overline{CD}$ then calculate the area of Δ ABC.

15) If ABC is a triaqngle in which AB = 3 cm , BC = 4 cm and AC = 5 cm show if the triangle ABC is right - angled or not ? then determine the right angle if it exist.

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16) Using the geometric tools , draw an angle of measure 65° then bisect it.

17) Draw Δ ABC in which AB = AC = 6 cm. and m($\angle$A) = 70° using the compasses and the ruler to bisects $\angle$B and $\angle$ C by two bisectors meeting at M

18) Mention two cases of congruency of two triangles.

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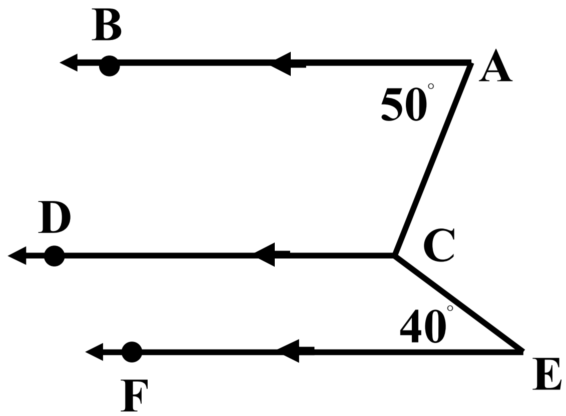
[5] Complete:

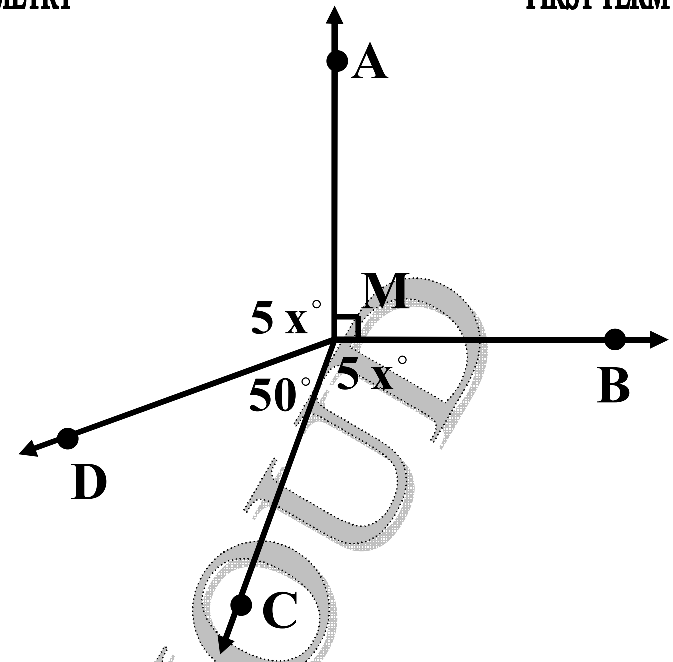
1) In the opposite figure :

m($\angle$ACE) = ...



2) In the opposite figure :

the value of x = ...



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3) If a straight line cuts two parallel straight lines ,

then each two corresponding angles are

.... in measure.

4) The sum of the measures of the accumulative angles

at a point equals ....°

5) If two straight lines intersect, then each two vertical

opposite angles are …….. in measure.

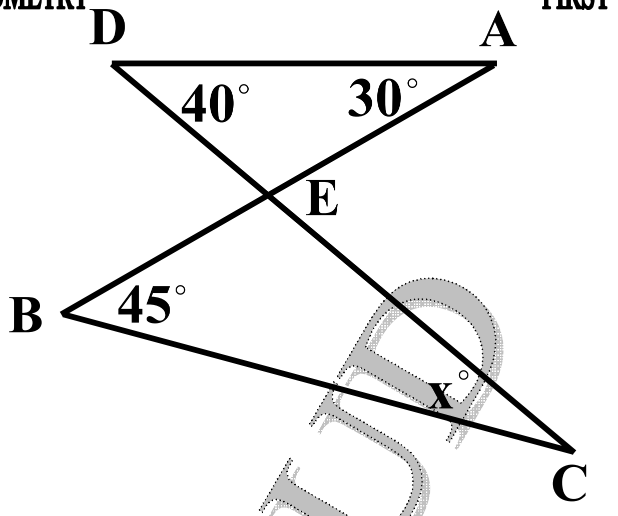
6) The perpendicular to one of two parallel

straight lines is .... the other.

7) In the opposite figure :

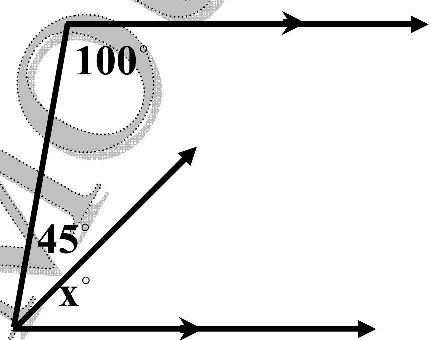
If $\overline{AB} \cap \overline{CD} = \{E\}$

then x = ...



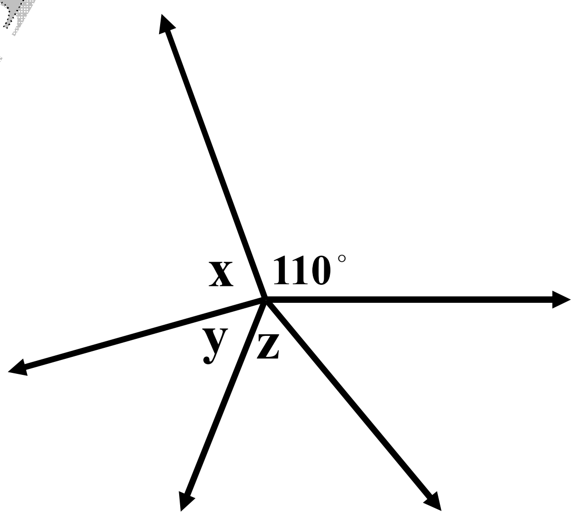
8) In the opposite figure :

The value of x = ...°



9) In the opposite figure :

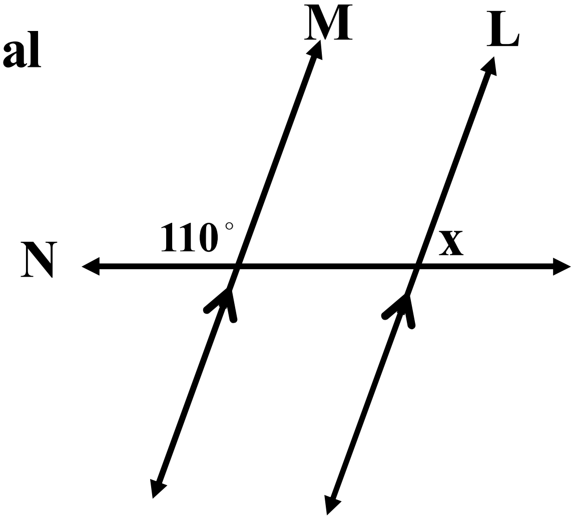
x + y + z = ...°



10) In the opposite figure :

L // M and N is a transversal

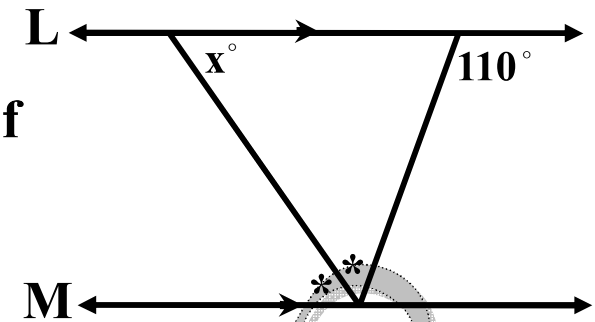
to them then x = ...



11) In the opposite figure :

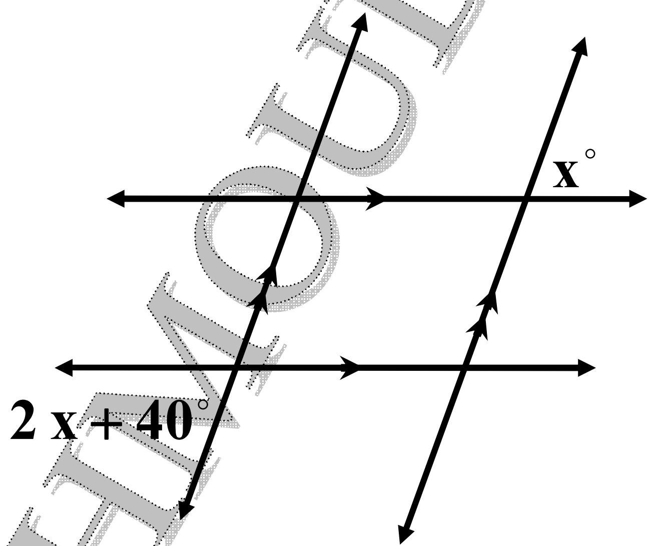
If L // M , then the value of

x = ...



12) In the opposite figure :

The value of x = ...

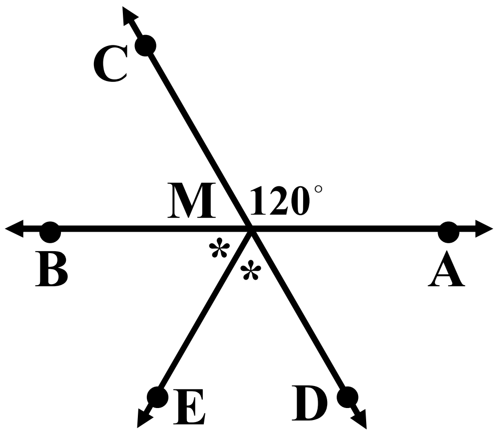


13) In the opposite figure :

$\overleftrightarrow{AB} \cap \overleftrightarrow{CD} = \{M\}$ and $\overrightarrow{ME}$

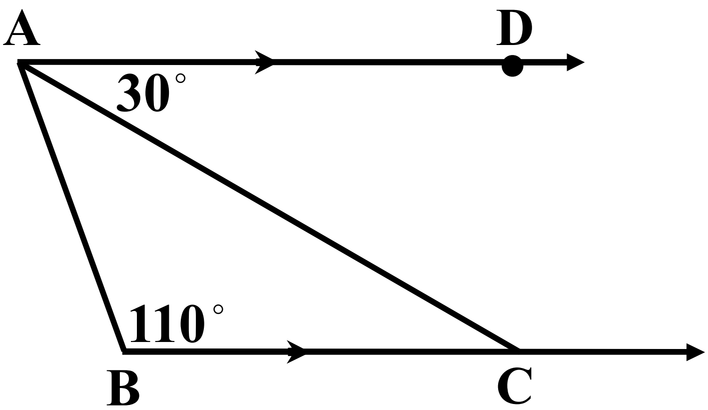
bisects $\angle BMD$

then m($\angle$AME) = ...°



14) In the opposite figure :

m($\angle$BAC) = ...°

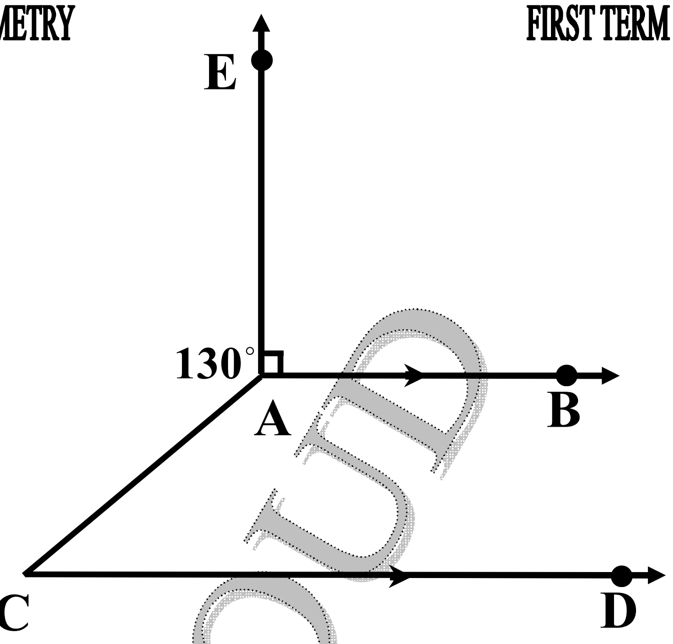


15) In the opposite figure :

If $\overrightarrow{AB} \parallel \overrightarrow{CD}$, $\overline{AE} \perp \overline{AB}$

and $m(\angle EAC) = 130^\circ$

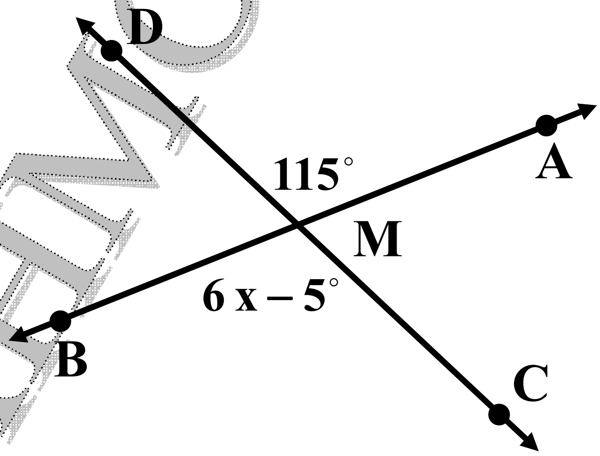
then $m(\angle C) = ...^\circ$



16) In the opposite figure :

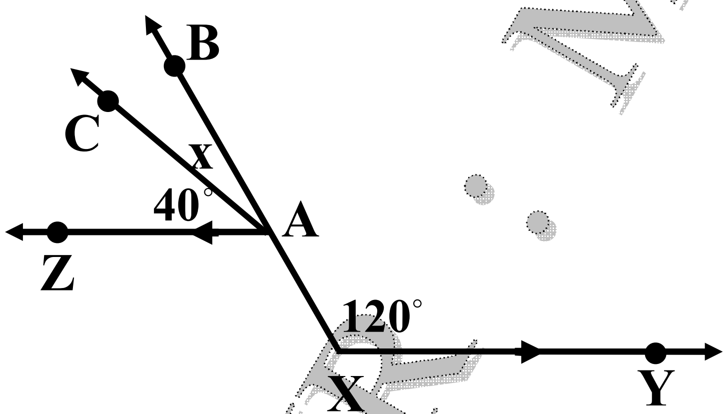
$\overleftrightarrow{AB} \cap \overleftrightarrow{CD} = \{M\}$

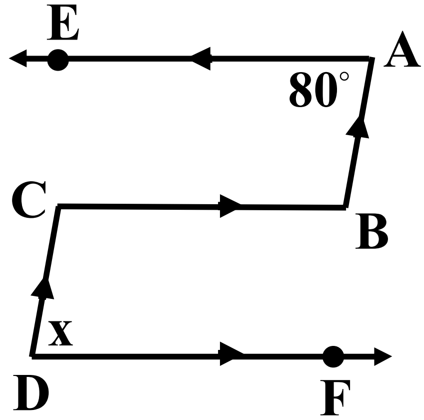
The value of $x = ...^\circ$



[6] In The opposite figure:

Find the value of x





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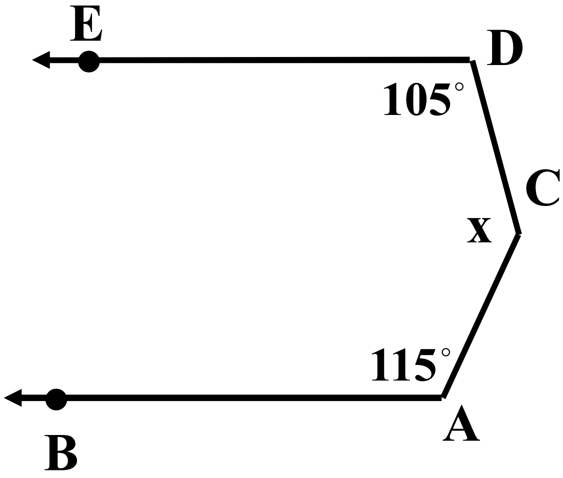
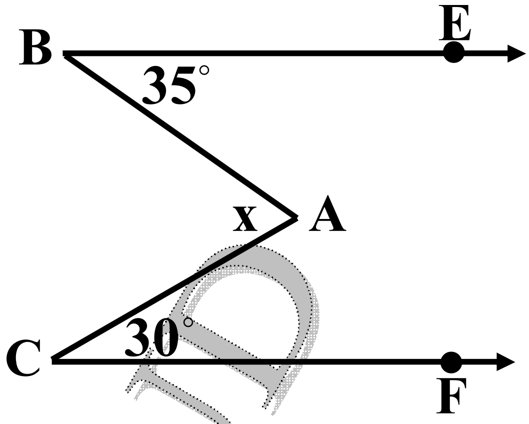

E
D
105°
C
x
115°
A
B


B
E
35°
x
A
30°
C
F

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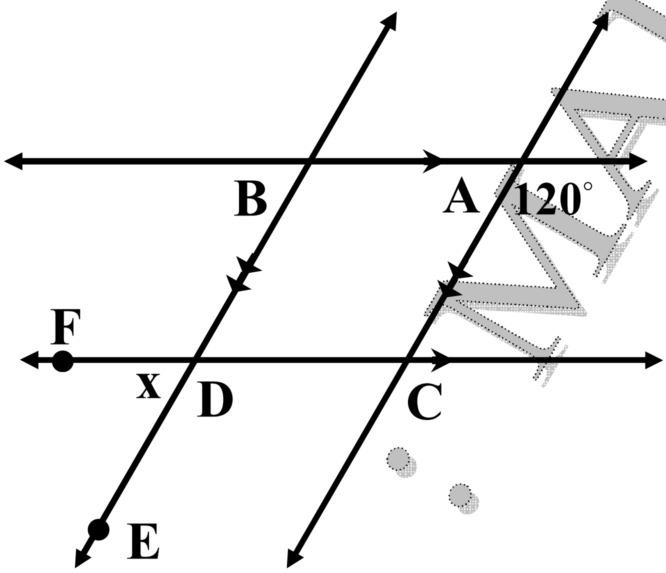
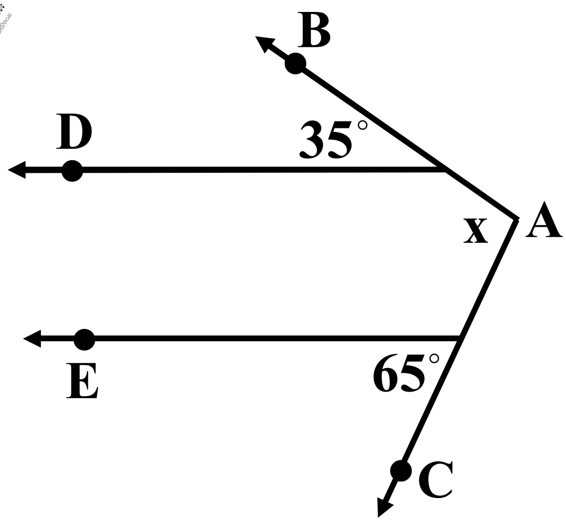

B
A
120°
F
x
D
C
E


B
D
35°
x
A
E
65°
C

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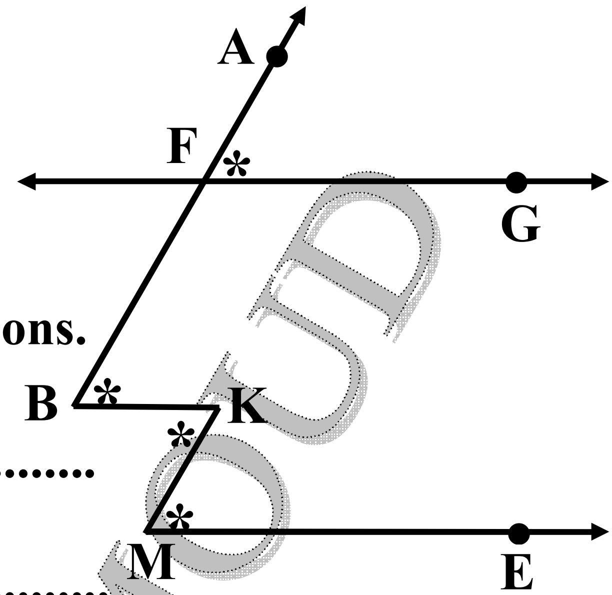
[7] In The opposite figure:



$m(\angle AFG) = m(\angle B)$
$= m(\angle K) = m(\angle M)$
write the four pairs of
parallel lines. give yor reasons.

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[8] In each of the following figures , show if the two triangles are congruent or not if they are congruent name the case of congruence.

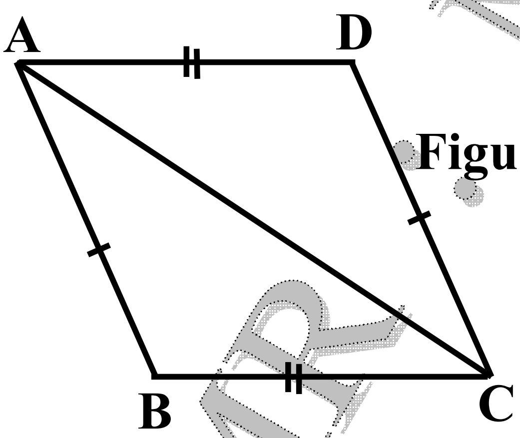

Figure (1)

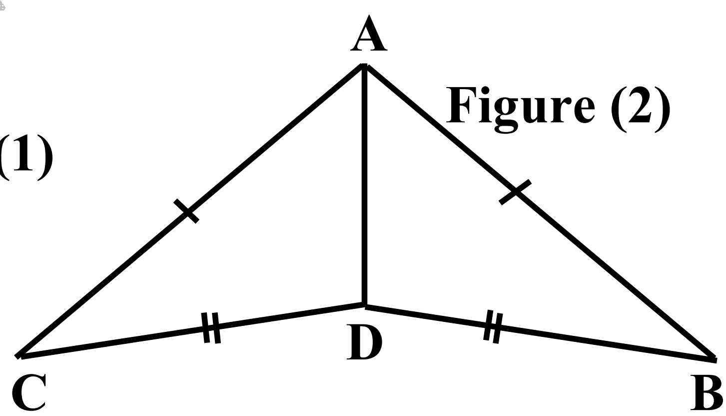

Figure (2)

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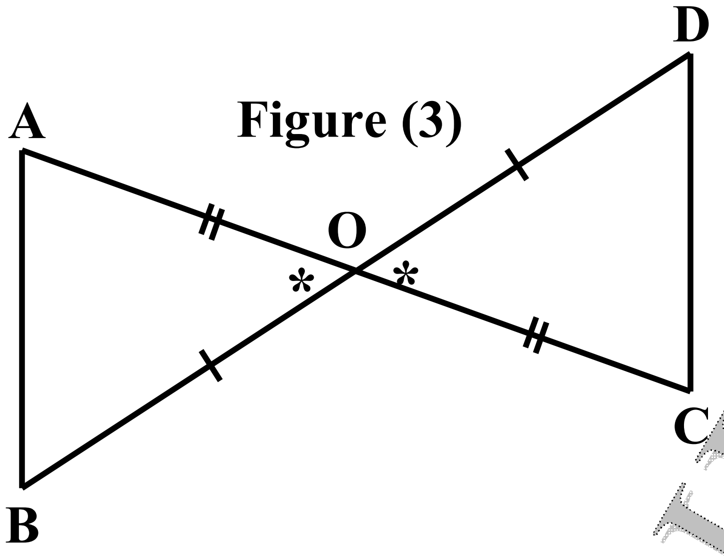

Figure (3)

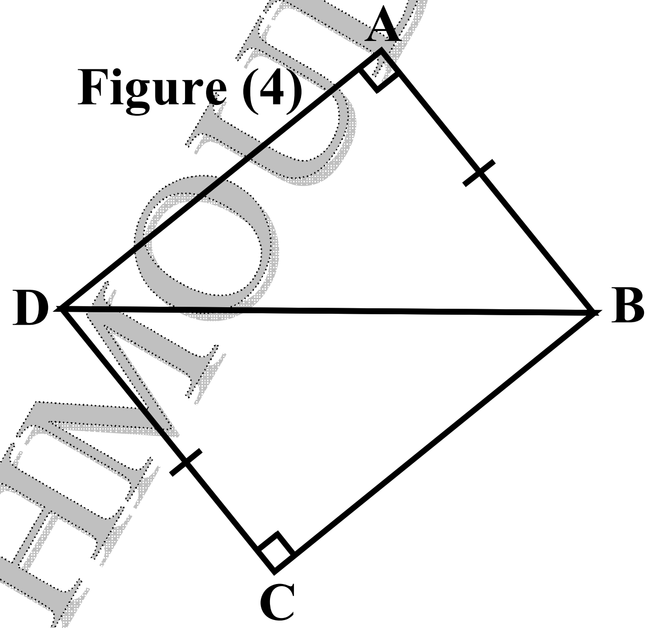

Figure (4)

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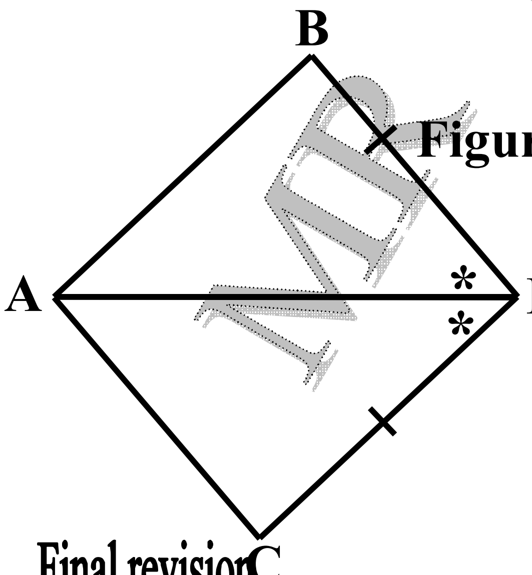

Figure (5)

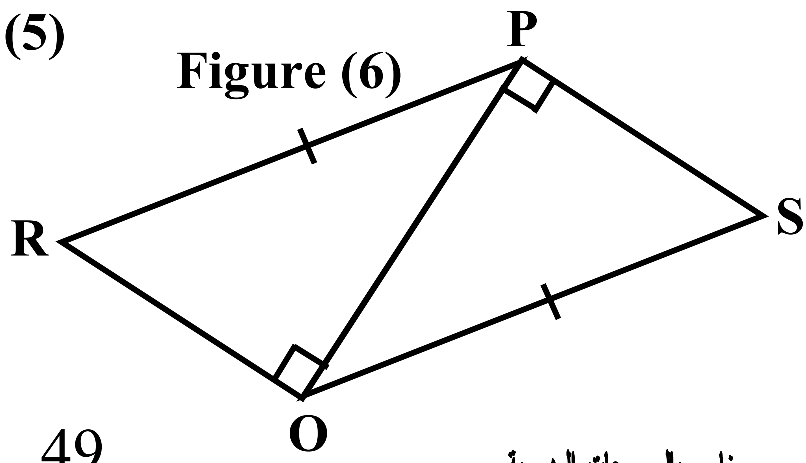

Figure (6)

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[9] In each of the following figures , show if the two triangles are congruent or not if they are congruent name the case of congruence.

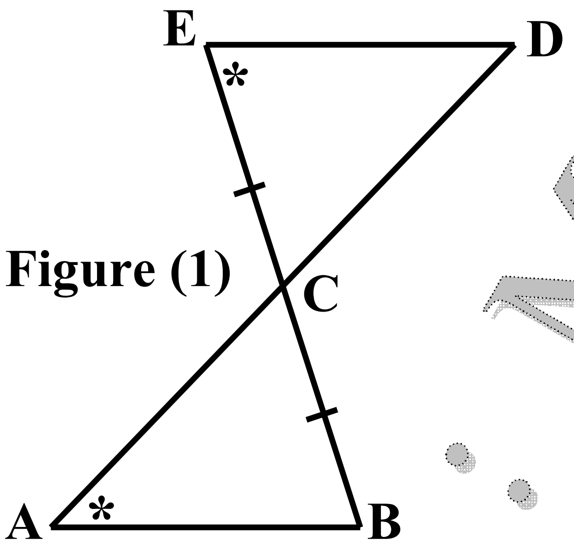

Figure (1)

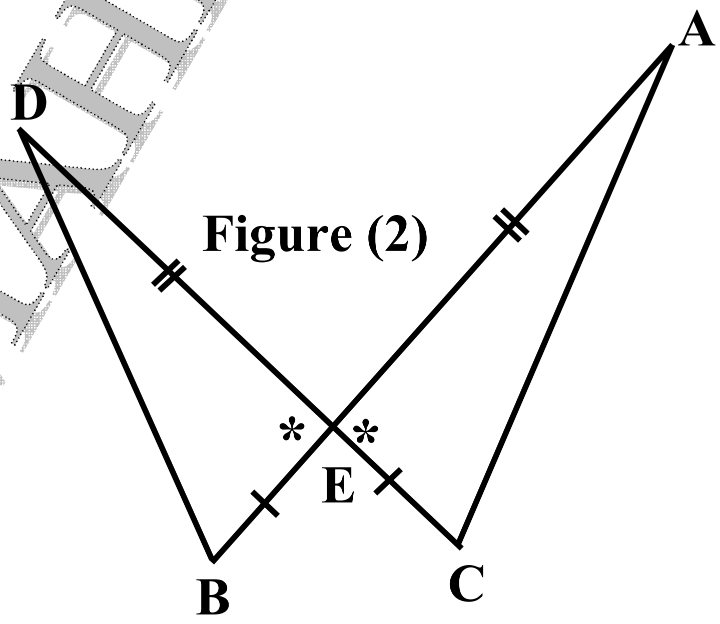

Figure (2)

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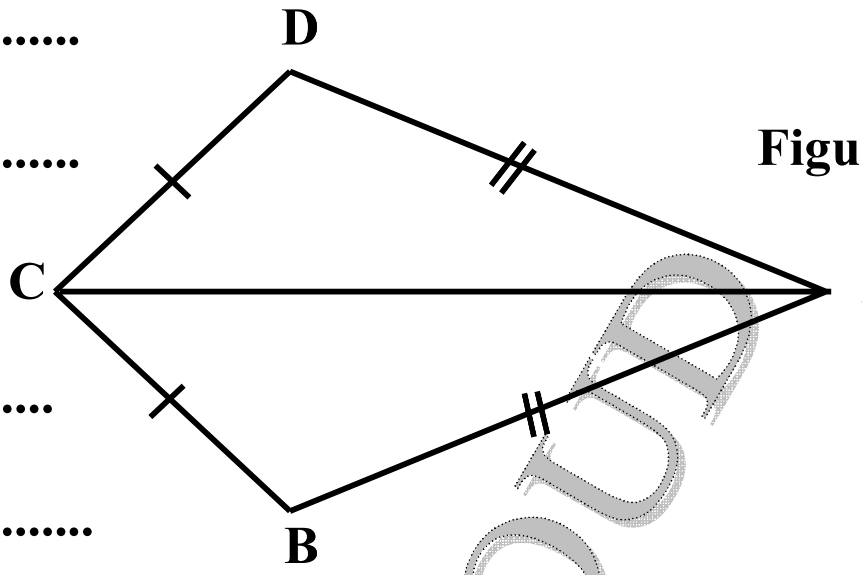


Figure (3)

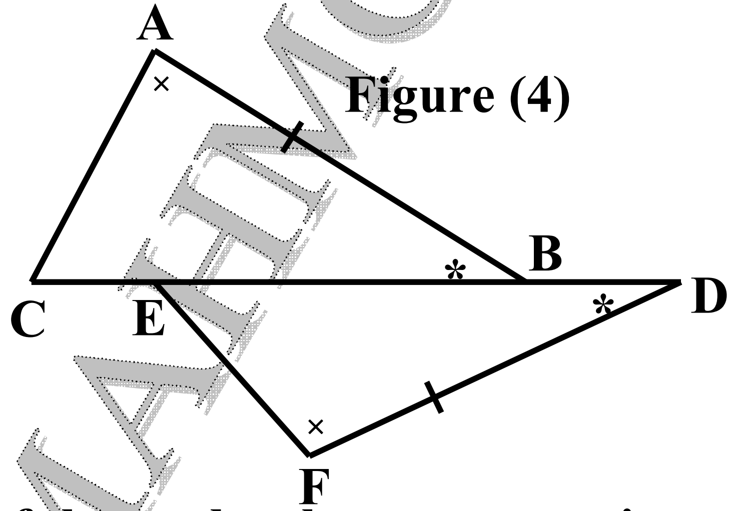


Figure (4)

[1] Mention the type of the angle whose measure is as the following:

1) 57° .... 2) 117° .... 3) 90° ....

4) 200° .... 5) 180° .... 6) $90\frac{2}{5}^\circ$ ....

7) $181\frac{3}{4}^\circ$ .... 8) $43\frac{1}{2}^\circ$ ....

[2] **Write the measure of the angle which complements each of the angles whose measure are as follow:**

1) 20° ………….. 2) 90° ………….. 3) 152° …………..

4) 0° ………….. 5) $92\frac{1}{2}^\circ$ ………….. 6) 180° …………..

7) 10° ………….. 8) $141\frac{2}{5}^\circ$ …………..

[3] **Write the measure of the angle which supplements each of the angles whose measure are as follow:**

1) 30° ………….. 2) 60° ………….. 3) 48° …………..

4) 0° ………….. 6) 90° …………..

5) $32\frac{1}{2}^\circ$ ………….. 7) $25\frac{3}{4}^\circ$ ……….. 8) $53\frac{1}{4}^\circ$ …………

[4] Complete:

1) The angle is ……….

2) Measure of the right angle = …….

3) The acute angle is the angle whose measure is less Than ……….. and greater than ………..

4) The sum of the complementary angles = ………..

5) The sum of the supplementary angles = …………

6) Measure of the straight angle = ………..

And the measure of zero angle = ……….

7) The two adjacent angles formed from the

Intersection of a ray and a straight line are...........

[5] Complete the following

1) The acute angle complements an..............angle and

Supplements...........................angle.

2) The zero angle complements a...................and

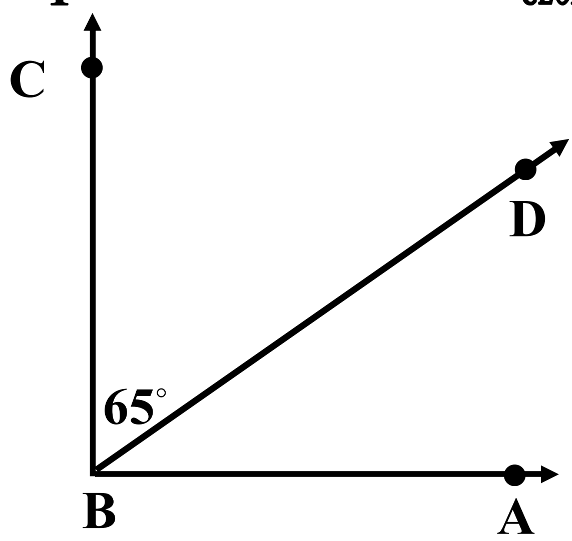
Supplements a.........................angle.

3) The right angle complements..................angle and

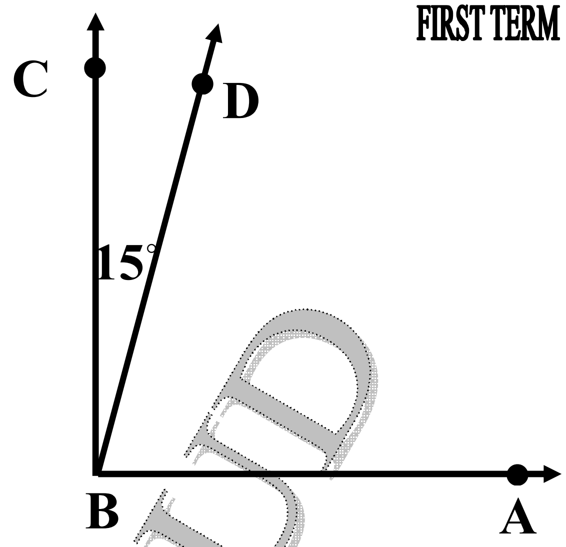
Supplements a....................angle.

4) The obtuse angle supplements................angle.

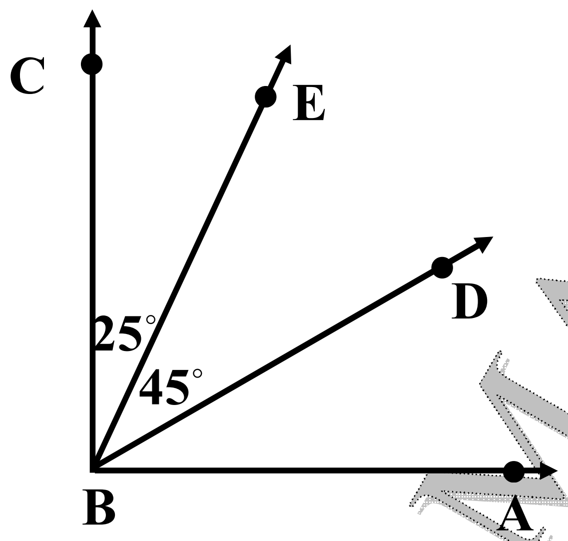
[6] In each of the following figures if $\overrightarrow{BA} \perp \overrightarrow{BC}$ find the Measures of the required angle under each figure :



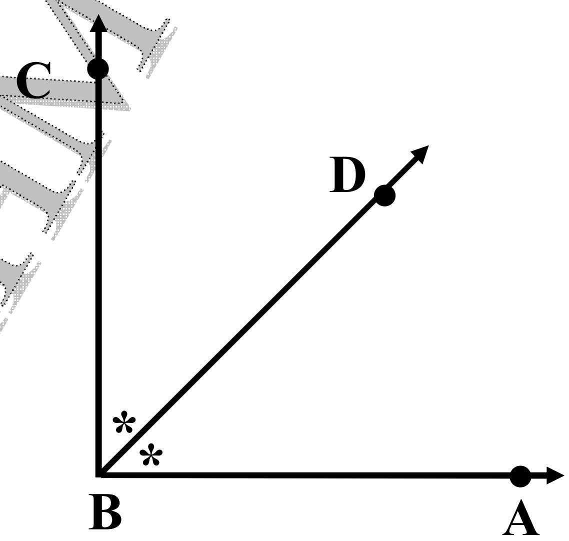
1) m(∠ABD) = ...°



2) m(∠ABD) = ...°



3) m(∠ABD) = ...°

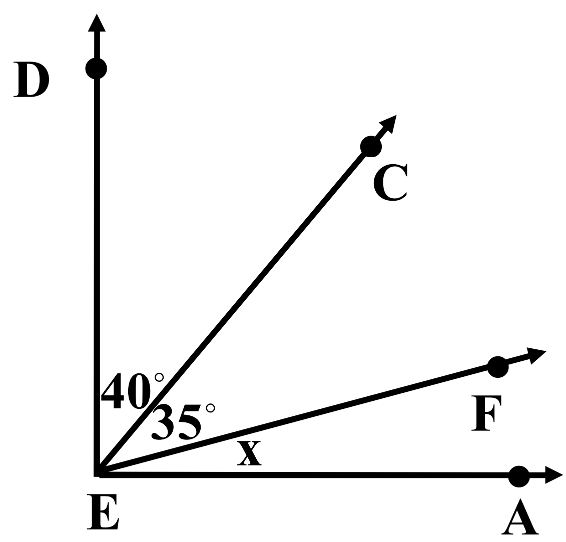


4) m(∠ABD) = ...°

[7] Complete:

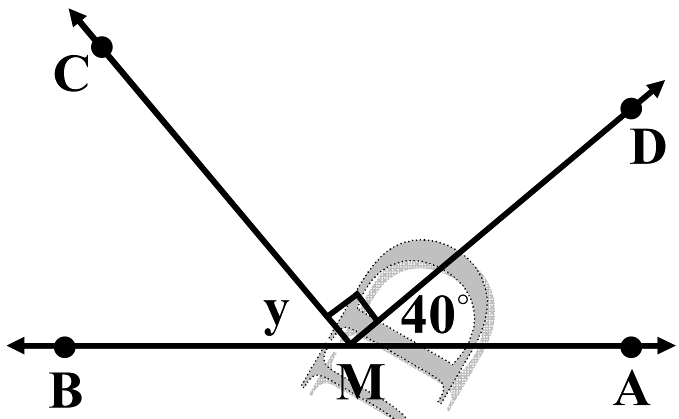
1) If $\overrightarrow{EA} \perp \overrightarrow{ED}$

Then x = ...°



2) If $M \in \overleftrightarrow{AB}$

$y = ...^{\circ}$

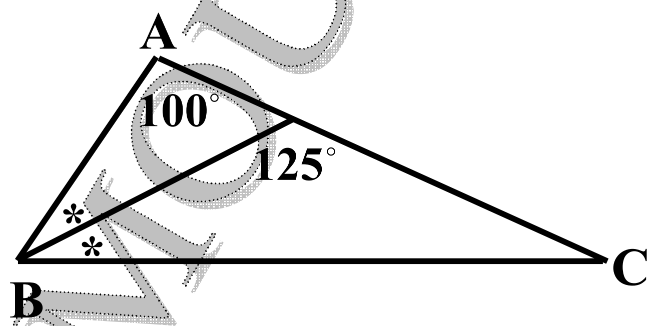


3) ABC is a triangle

$D \in \overline{AC}$ and $\overrightarrow{BD}$ is

A bisector of $\angle B$

Then $m(\angle C) = ...$



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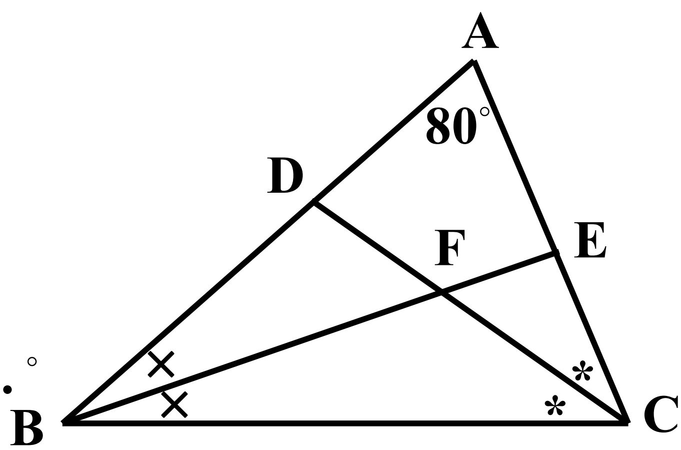
4) $m(\angle A) = 80^{\circ}$, $\overrightarrow{BE}$ is

The bisector of $\angle B$

$\overrightarrow{CD}$ is the bisector of

$\angle C$ then $m(\angle BFC) = ...^{\circ}$



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Complete:

1) The sum of measures of the accumulative angles at a point = ……

2) The angle whose measure is 72° complements the angle whose measure is ……

3) If $m(\angle A) = 150^\circ$, then $m(\text{reflex} \angle A) =$ ....

4) The two adjacent complementary angles , their terminal sides are ……..

5) If $\angle A$ supplements $\angle B$, $\angle A \equiv \angle B$, then $m(\angle B) =$ ......

6) The measure of the straight angle = ………

7) If one of the two supplement angles is acute then the other is …… angle.

8) If $m(\angle A) = 170^\circ$, then $m(\text{reflex} \angle A) =$ ....

9) …….. < the measure of the obtuse angle < ……..

10) If $\angle A$ supplements $\angle B$, and $m(\angle A) = 2\,m(\angle B)$,

then $m(\angle B) = \ldots\ldots.$

11) The sum of measures of the two complementary angles = …….

12) The sum of measures of the two supplementary angles equals ………

13) If $m(\angle X) = \frac{1}{2} m(\angle Y)$ and $m(\angle X) = 30^\circ$, then the two angles X and Y are......

14) The two adjacent angles formed by intersecting a straight line and a ray whose start point lies on the straight line are …….

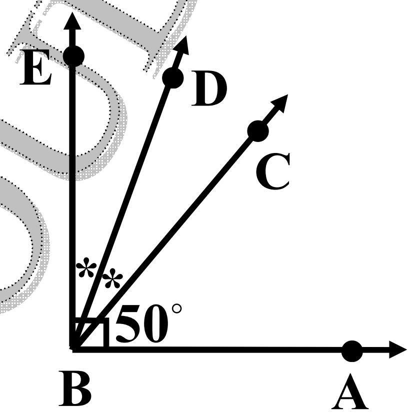
Complete:

1) If $m(\angle X) = \frac{1}{2} m(\angle Y)$ and $m(\angle X) = 60^\circ$, then the two angles X and Y are ....

2) In the opposite figure:

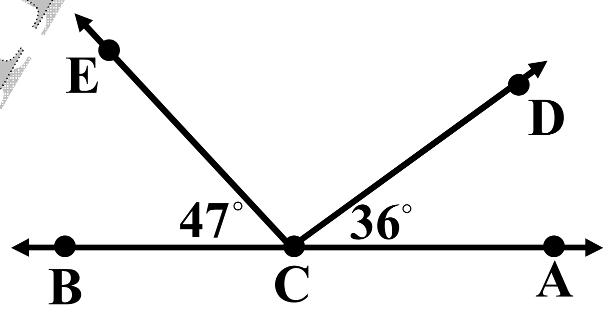
If $m(\angle ABC) = 50^\circ$, $\overrightarrow{BD}$ bisects $\angle CBE$

$\overrightarrow{BD} \perp \overrightarrow{BE}$, then $m(\angle CBD) =$ .....



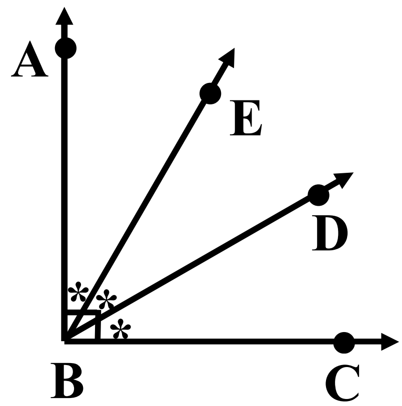
3) In the opposite figure:

$m(\angle DCE) =$ ....



4) In the opposite figure:

If $\overrightarrow{BA} \perp \overrightarrow{BC}$, then $m(\angle CBE) =$ ......

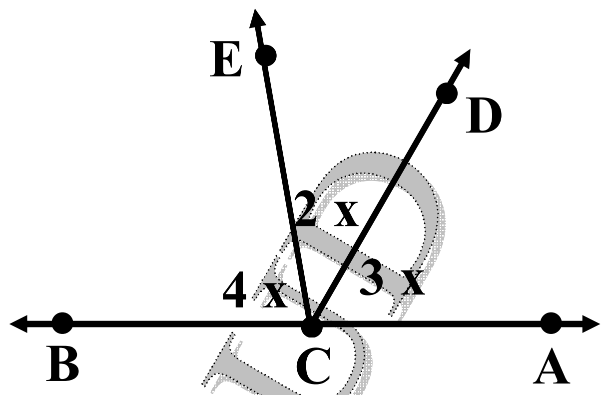


Test (7)

Complete:

1) In the opposite figure:

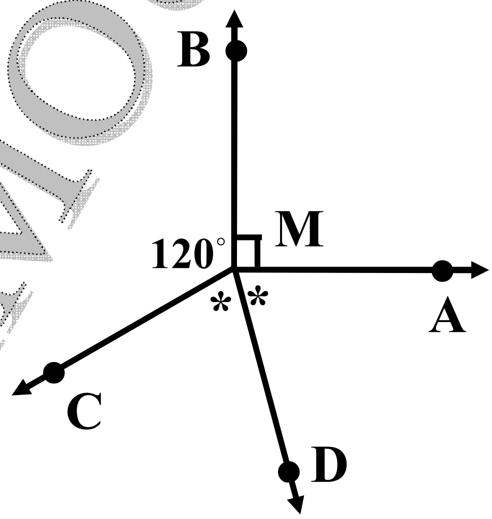
If $A \in \overleftrightarrow{BC}$, then $x = ...$



2) In the opposite figure:

$\overrightarrow{MD}$ bisects $\angle AMC$,

then $m(\angle AMD) = ...$

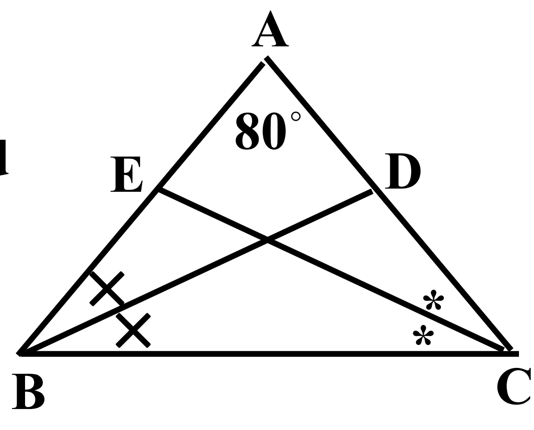


3) In the opposite figure:

$m(\angle A) = 80^\circ$, $\overrightarrow{BD}$ bisects $\angle B$ and

$\overrightarrow{CE}$ bisects $\angle C$,

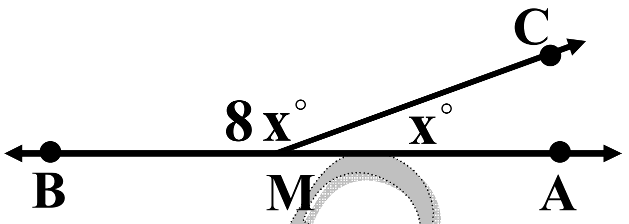
then $m(\angle CFB) = ...$



Test (8)

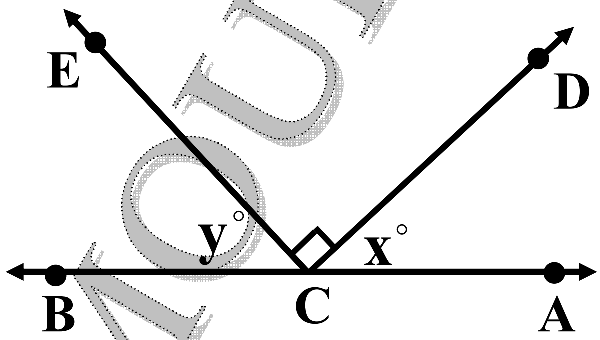
Complete:

1) In the opposite figure:



If $M \in \overleftrightarrow{AB}$, then $x = ...$

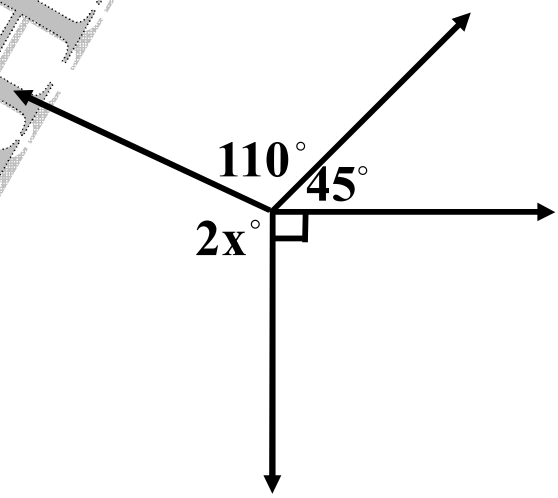
2) In the opposite figure:



If $C \in \overleftrightarrow{AB}$

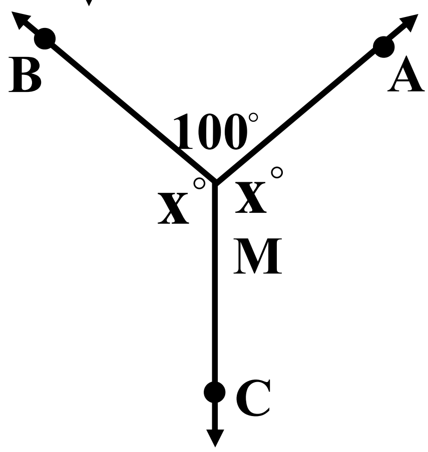
then $x^\circ + y^\circ = ...$

3) In the opposite figure:



$x = ...$

4) In the opposite figure:



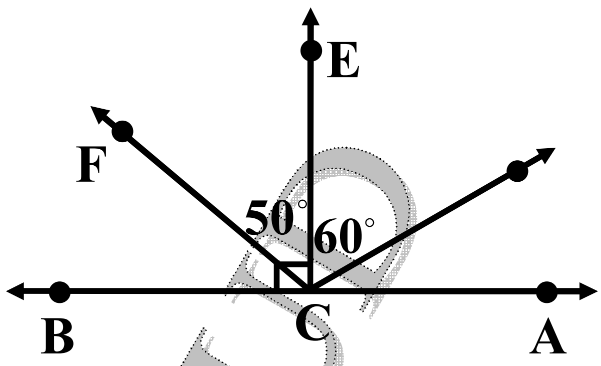
If $m(\angle AMB) = 100^\circ$

, then $x = ...$

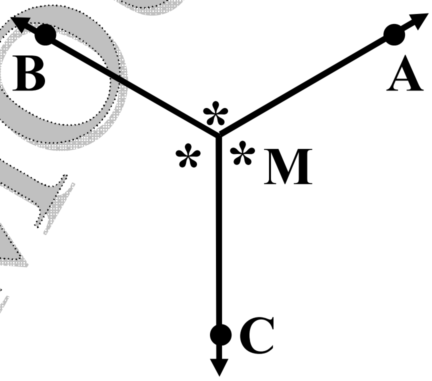
Test (9)

Complete:

1) The number of obtuse angle in the opposite figure is ……..

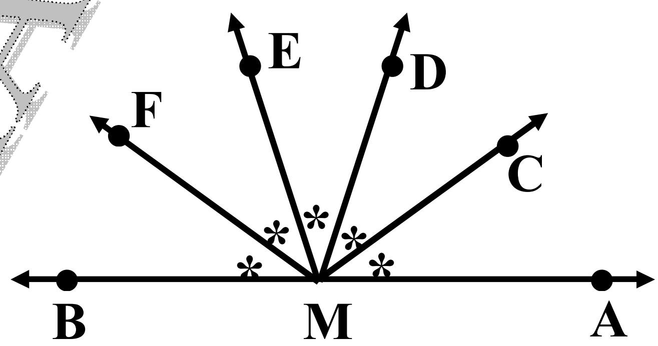


2) In the opposite figure: m(∠AMC)= ....°



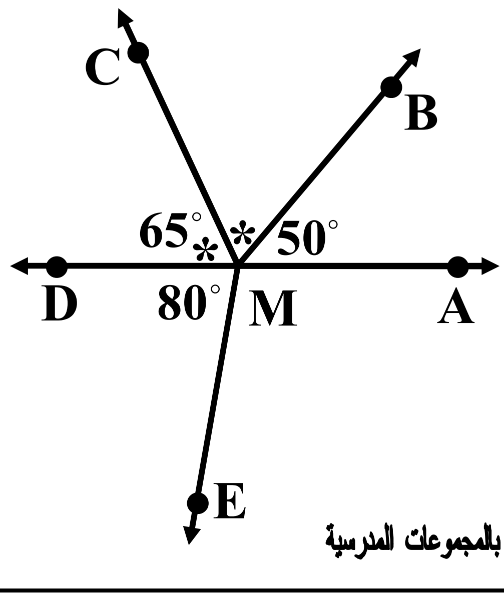
3) In the opposite figure:

If $M \in \overleftrightarrow{AB}$, then m(∠AMC)= ....



4) Find the measure of the required angle:

If $\overrightarrow{MC}$ bisects ∠BMD then m(∠AME)= ....



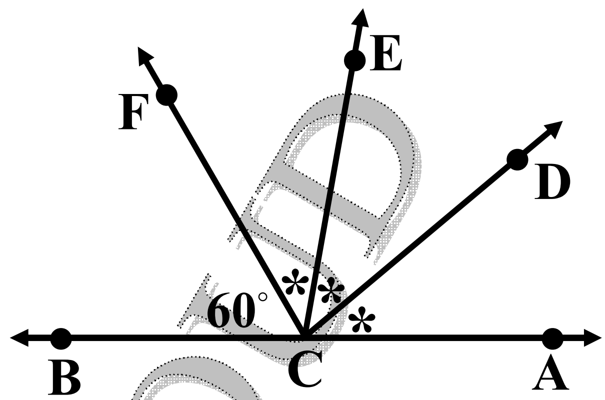
Test (10)

Complete:

1) Find the measure of the required angle:

If $C \in \overleftrightarrow{AB}$ then

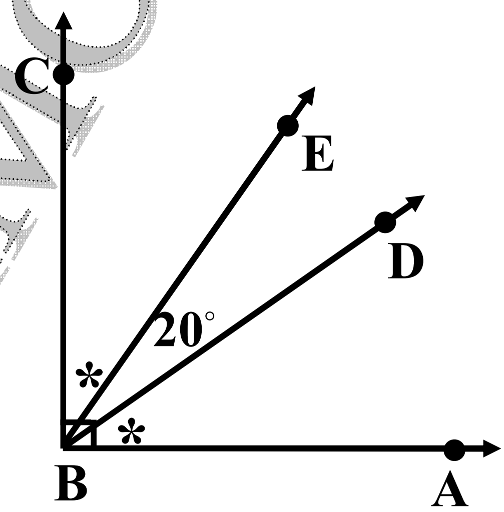
$m(\angle DCB) = ...$



2) Find the measure of the required angle:

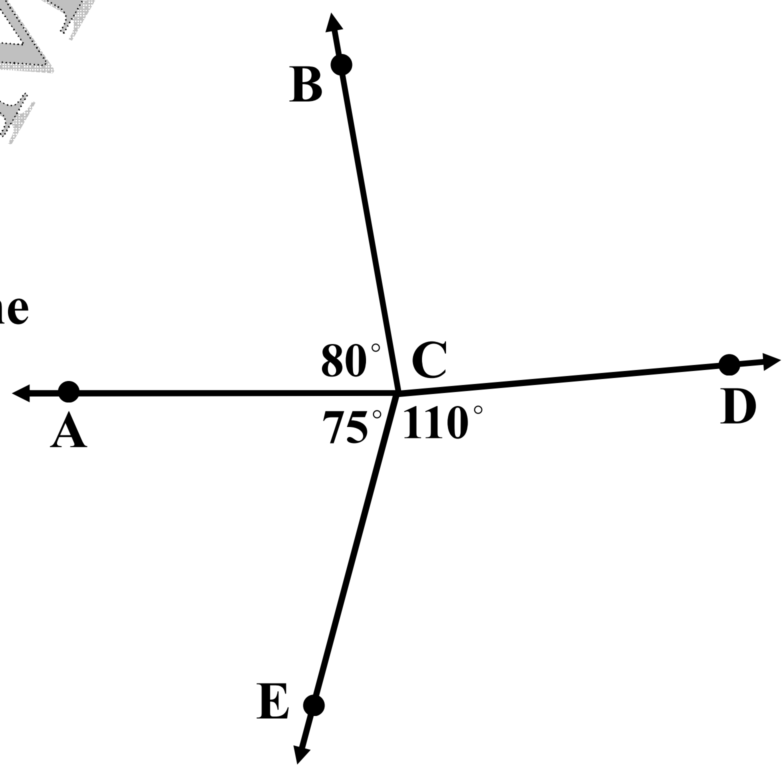
If $\overrightarrow{BA} \perp \overrightarrow{BC}$

then $m(\angle ABD) = ...$



3) Find the measure of the required angle

$m(\angle BCD) = ...$



Test (11)

[1]In the opposite figure:

$\overleftrightarrow{AB} \parallel \overleftrightarrow{CD} \parallel \overleftrightarrow{EF} \parallel \overleftrightarrow{GH}$

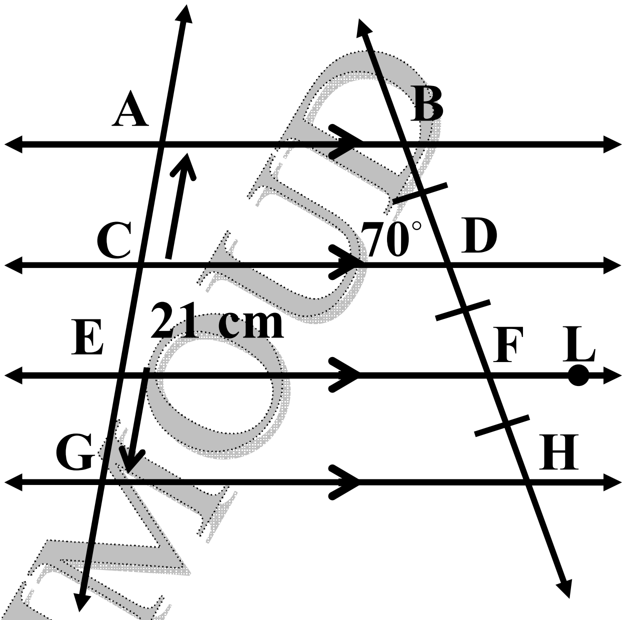
, $AG = 21\text{ cm}$, $m(\angle BDC) = 70^\circ$

Find :

1) The length of $\overline{AE}$

2) $m(\angle ABD)$

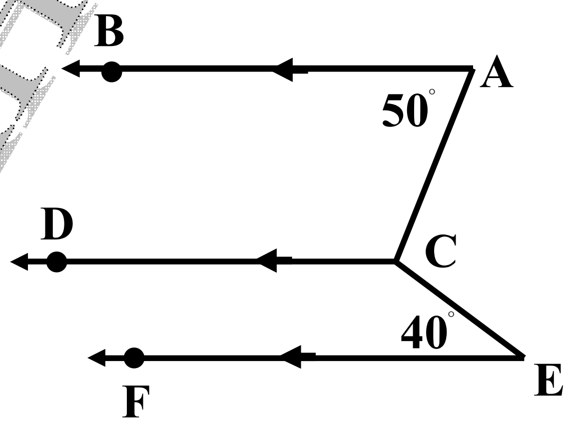
3) $m(\angle HFL)$



[2] Complete:

1) In the opposite figure :

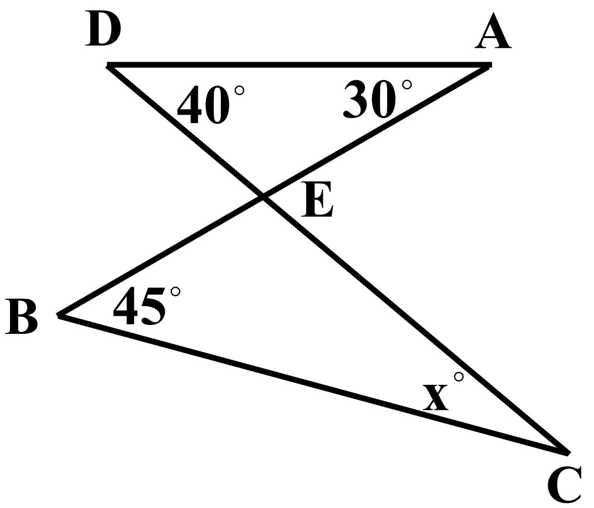
$m(\angle ACE) = ...$



2) In the opposite figure :

If $\overline{AB} \cap \overline{CD} = \{E\}$

then $x = ...$



Test (12)

[1] **In each of the following figures , show if the two triangles are congruent or not if they are congruent name the case of congruence.**

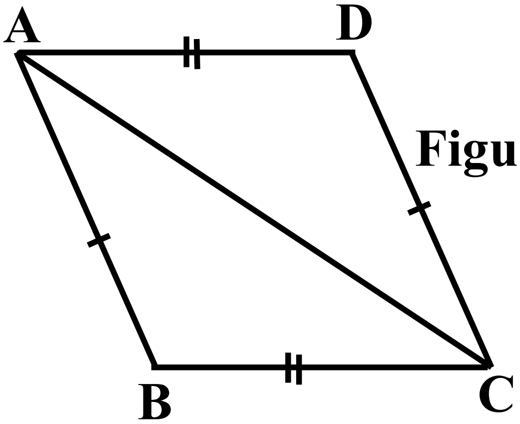


Figure (1)

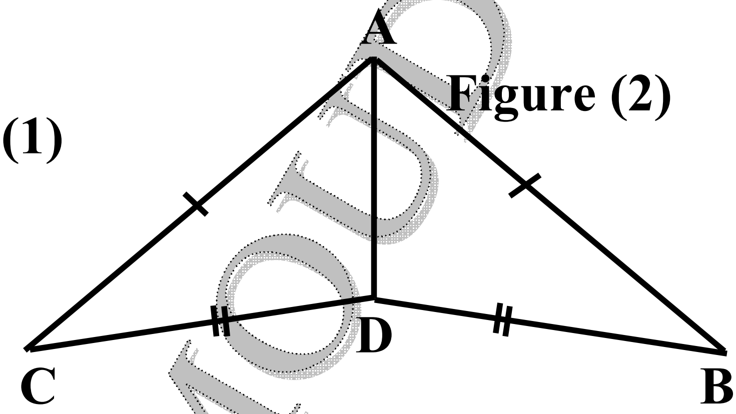


Figure (2)

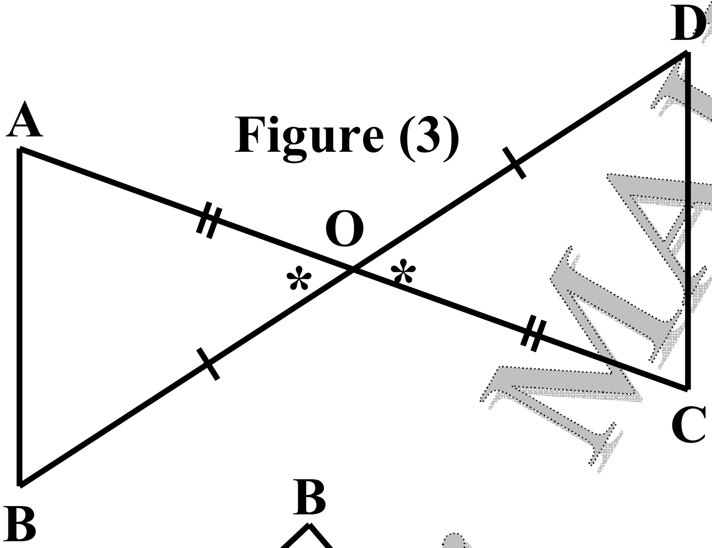


Figure (3)

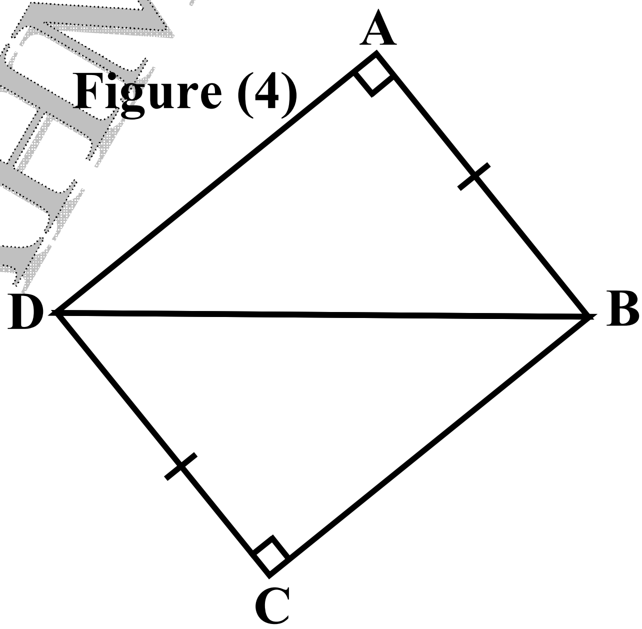


Figure (4)

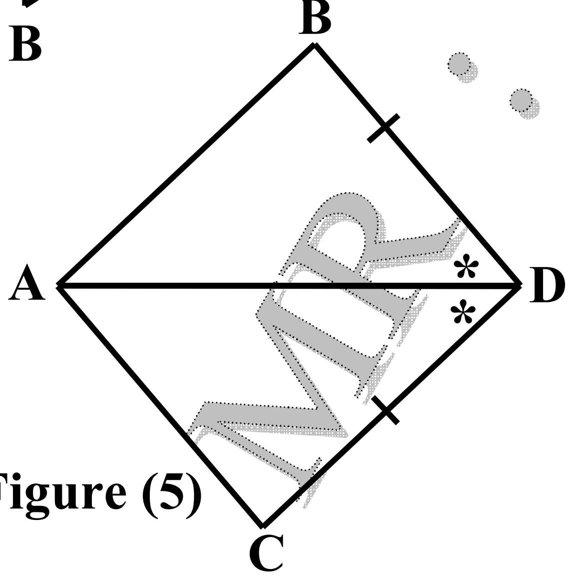


Figure (5)

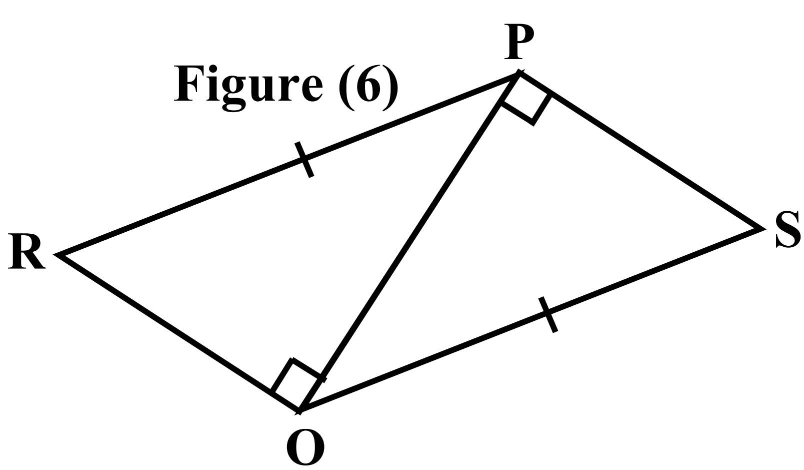


Figure (6)

Test (13)

[1] In each of the following figures , show if the two triangles are congruent or not if they are congruent name the case of congruence.

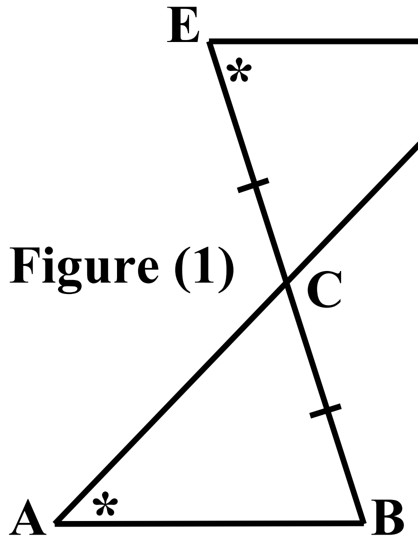


Figure (1)

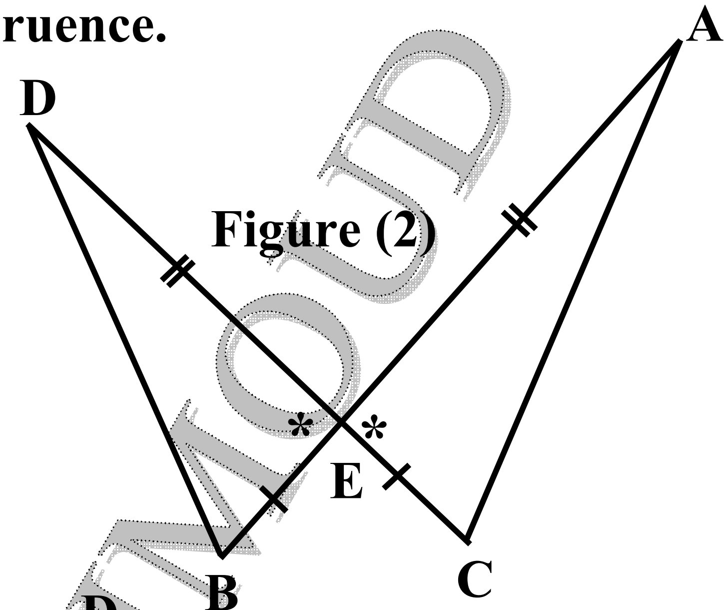


Figure (2)

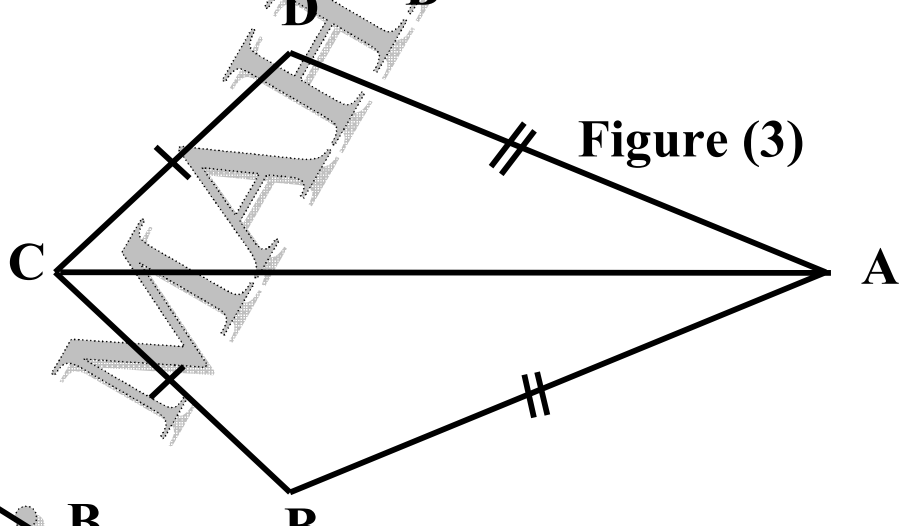


Figure (3)

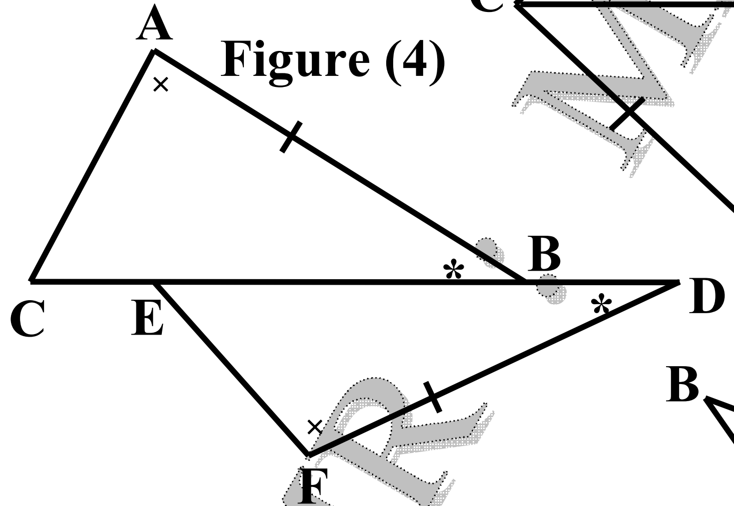


Figure (4)

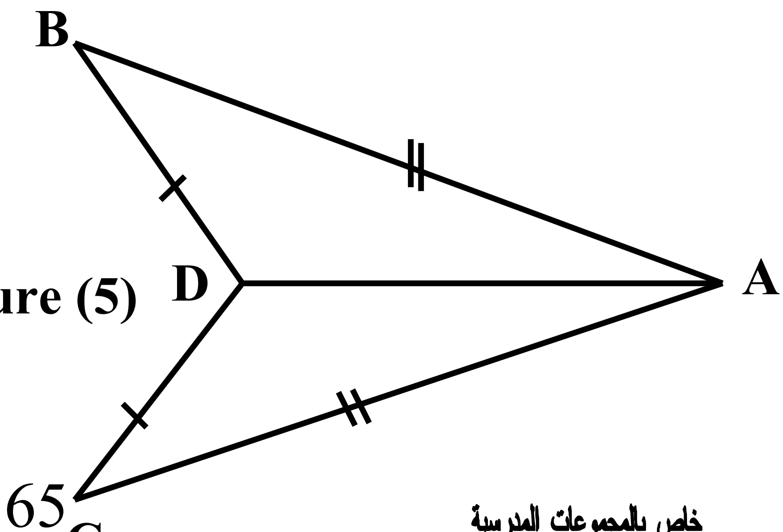


Figure (5)

[1] Complete:

1) The sum of measures of the accumulative angles at a point = ……

2) The angle whose measure is 72° complements the angle whose measure is ……

3) If $\Delta\, ABC \equiv \Delta\, XYZ$ and $m(\angle X) = 50^\circ, m(\angle B) = 60^\circ$ then $m(\angle Z) = ...$

4) The diagonal of the rectangle divides its surface into two …….. triangles.

7) If $m(\angle A) = 150^\circ$, then $m(\text{reflex}\angle A) = ...$

9) If a line segment is extended from one side without limit, the produced figure is …….

10) If $\angle A$ supplements $\angle B$, $\angle A \equiv \angle B$, then $m(\angle B) = ...$

11) The measure of the straight angle = ………

13) If one of the two supplement angles is acute then the other is …… angle.

14) The two triangles are congruent if two sides and …. in one of them are congruent to their corresponding elements in the other.

16) …….. < the measure of the obtuse angle < ……..

17) If Δ XYZ is right-angled at X, XY = 12 cm, XZ = 9 cm. then $(YZ)^2$ = ...cm^2.

19) If $\Delta ABC \equiv \Delta XYZ$ then BC = ...

20) If $\angle A$ supplements $\angle B$, and $m(\angle A) = 2\,m(\angle B)$, then $m(\angle B)$ = ...

26) If ABC is a triangle in which AB = 5 cm, BC = 12 cm and AC = 13 cm then $m(\angle ....) = 90^\circ$

27) The two right-angled triangles are congruent if ….. in one of them are congruent with their corresponding elements in the other triangle.

31) In the right-angled triangle , the area of the square set up the hypotenuse equals …….

35) The two adjacent angles formed by intersecting a straight line and a ray whose start point lies on the straight line are …….

38) A rectangle of length 4 cm. and width 3 cm , then the area of the square set its diagonal equals …… cm²

Solution:

1) 360° 2) $90^\circ - 72^\circ = 18^\circ$

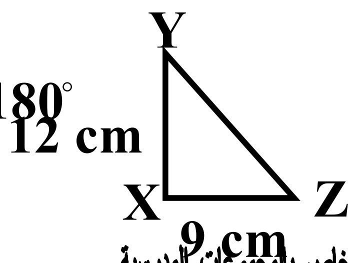
3) $m(\angle C) = 180^\circ - (50^\circ + 60^\circ) = 70^\circ \quad \therefore m(\angle Z) = m(\angle C) = 70^\circ$

4) Congruent 7) $360^\circ - 150^\circ = 210^\circ$

9) Straight line 10) $180^\circ \div 2 = 90^\circ$ 11) 180°

13) obtuse 14) The included angle

16) $90^\circ <$ the measure of the obtuse angle $< 180^\circ$



17) $(YZ)^2 = 12^2 + 9^2 = 225$

19) YZ

20) $180^\circ \div 3 = 60^\circ \quad \therefore m(\angle B) = 60^\circ$

26) $AC^2 = 13^2 = 169 \quad , AB^2 + BC^2 = 13^2 + 5^2 = 169$

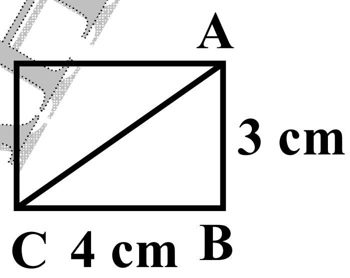
$\therefore AC^2 = AB^2 + BC^2 \quad \therefore \angle B$ is right

27) The hypotenuse and one side

31) The sum of the squares described on the other two sides

35) Supplementary

38) $3^2 + 4^2 = 25$



[1] **In each of the following figures , show if the two triangles are congruent or not if they are congruent name the case of congruence.**

Figure (1)

Δ ADC $\equiv$ Δ CAB

where :

1) AD = BC

2) $\overline{AC}$ is a common side

3) DC = AB

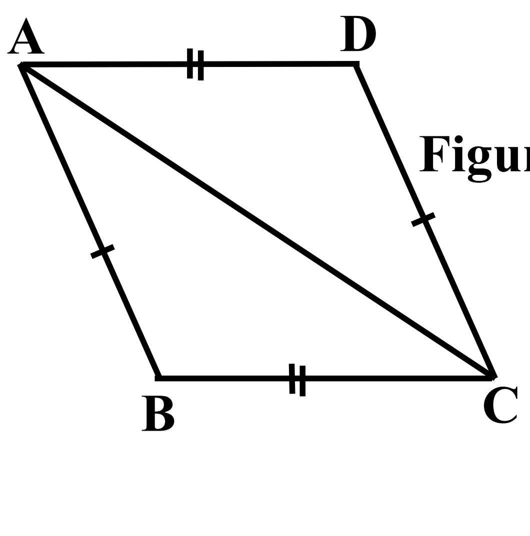
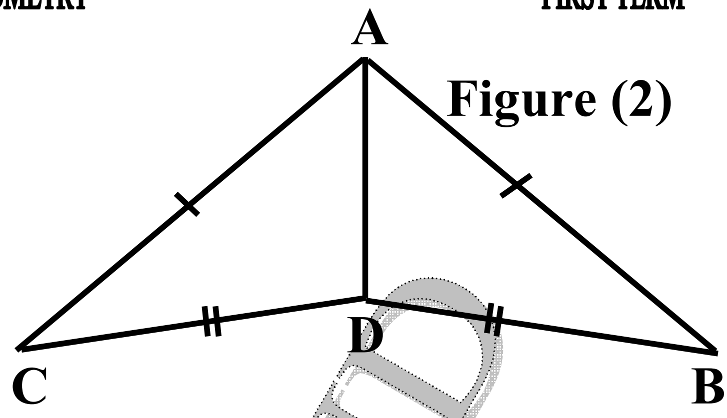


Figure (1)

Figure (2)



Δ ADC $\equiv$ Δ ADB

where :

1) AC = AB

2) $\overline{AD}$ is a common side

3) DC = DB

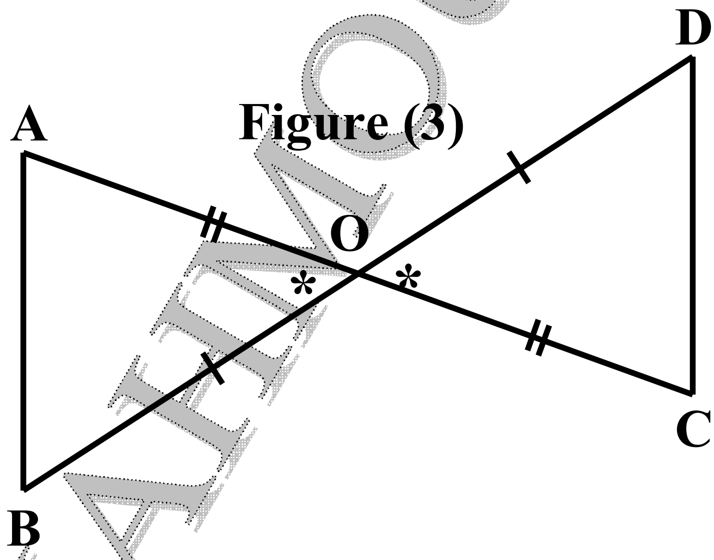


Figure (3)

Δ AOB $\equiv$ Δ COD

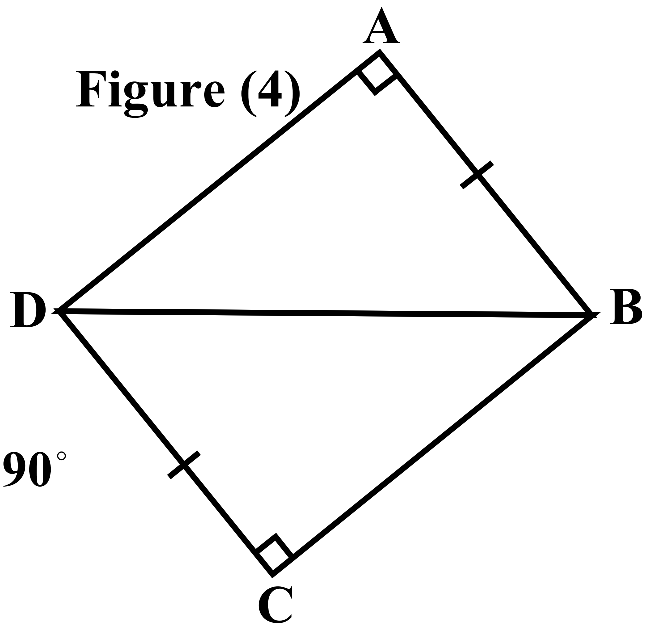
where :

1) AO = CO

2) m($\angle$AOB) = m($\angle$DOC)

3) OB = OD

Figure (4)



Δ ADB $\equiv$ Δ CBD

where :

1) AB = DC

2) $\overline{BD}$ is a common side

3) m($\angle$BAD) = m($\angle$BCD) = 90°

Figure (5)

Δ ADB $\equiv \Delta$ ADC

where :

1) DB = DC

2) $\overline{BA}$ is a common side

3) m($\angle$BDA) = m($\angle$CDA)

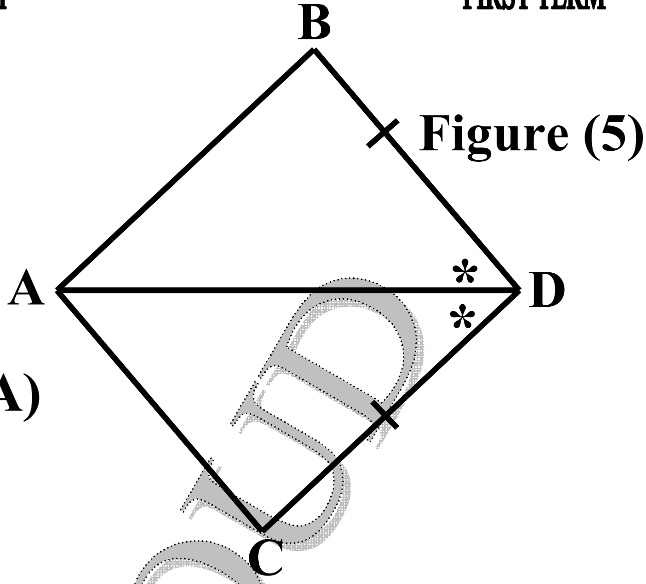


Figure (6)

Δ POR $\equiv \Delta$ OPS

where :

1) PR = OS

2) $\overline{PO}$ is a common side

3) m($\angle$POR) = m($\angle$OPS) = 90°

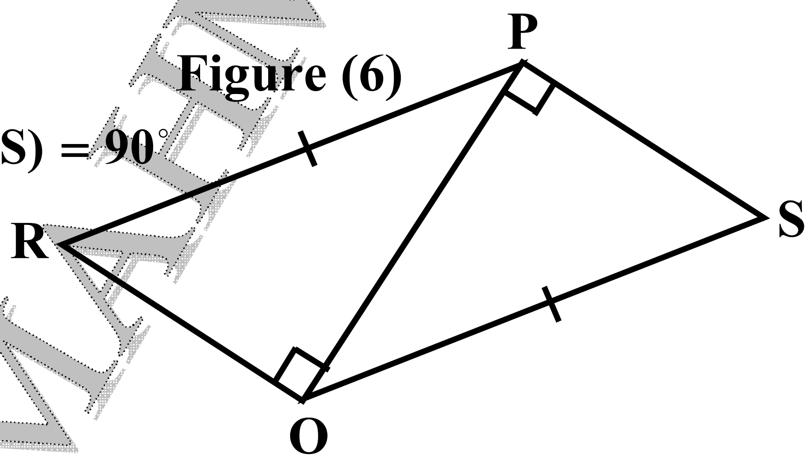


Figure (7)

The two triangles are not congruent

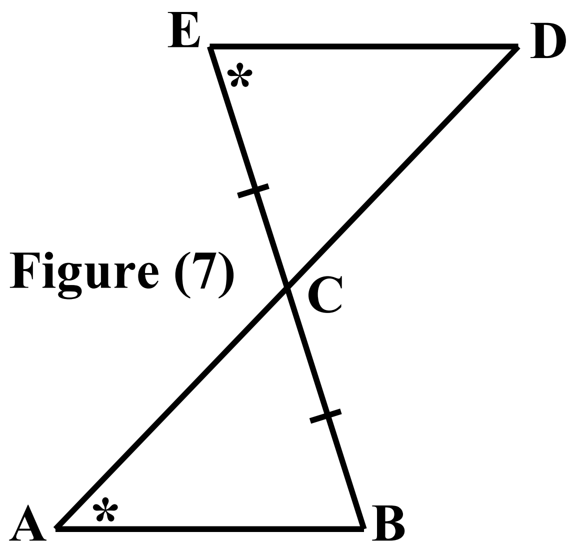


Figure (8)

Δ DEB $\equiv$ Δ AEC

where :

1) DE = AE
2) BE = CE
3) m($\angle$DEB) = m($\angle$AEC)

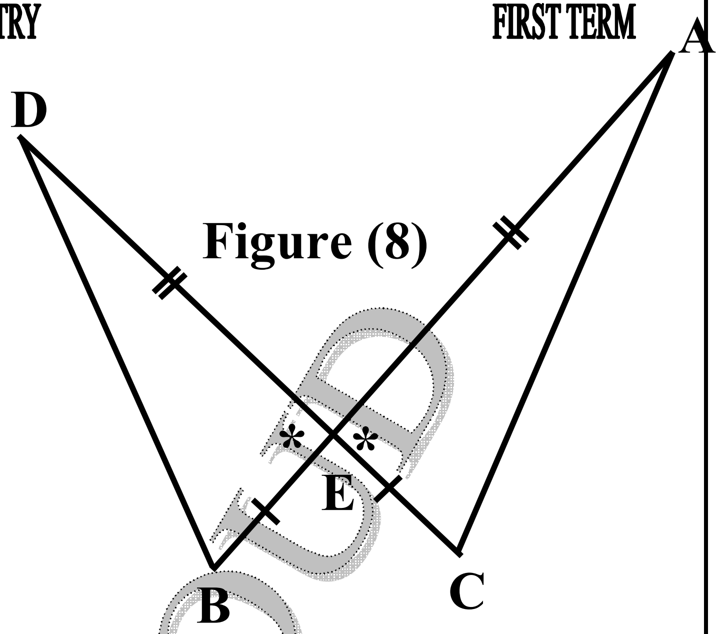


Figure (8)

Figure (9)

Δ ADC $\equiv$ Δ ABC

where :

1) AD = AB
2) DC = BC
3) $\overline{AC}$ is a common side

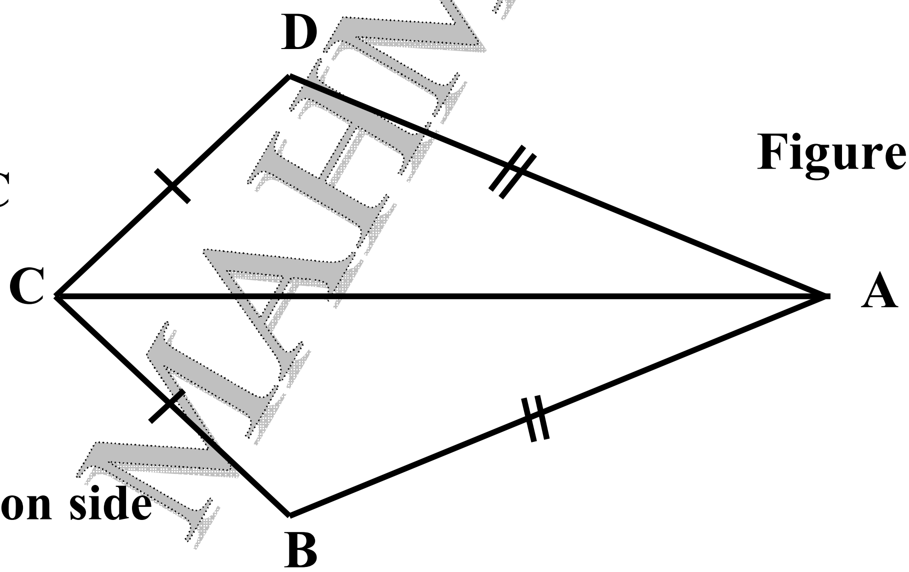


Figure (9)

Figure (10)

Δ FDE $\equiv$ Δ ABC

where :

1) FD = AB
2) m($\angle$FDE) = m($\angle$ABC)
3) m($\angle$DFD) = m($\angle$BAC)

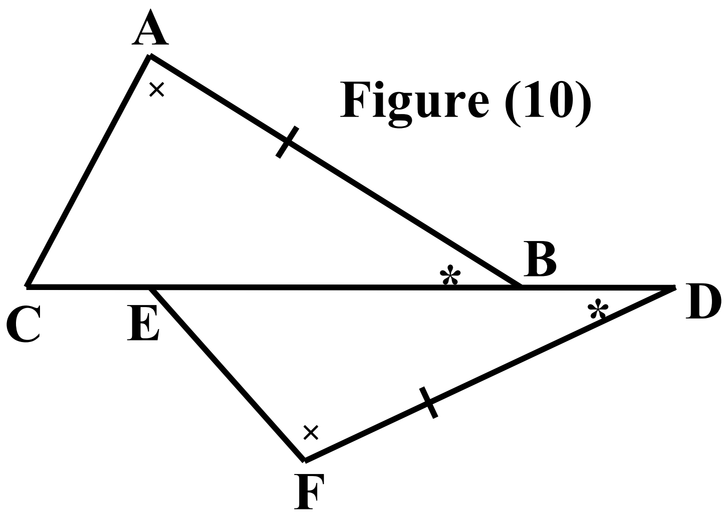
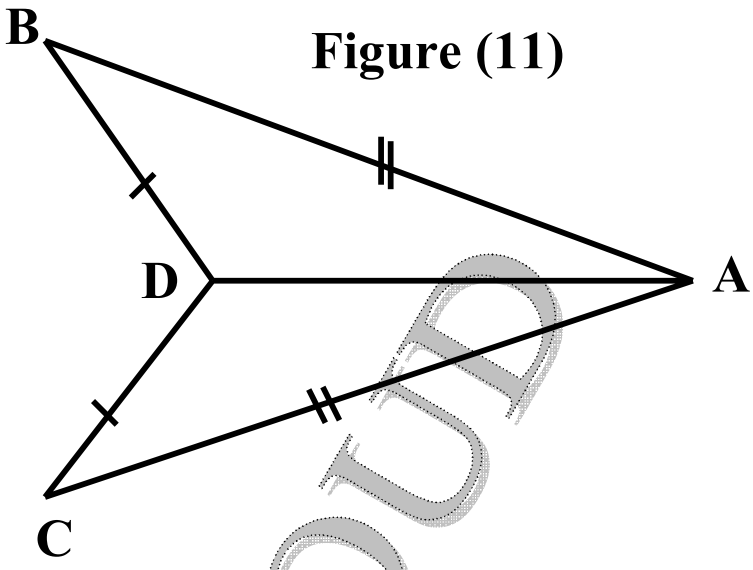


Figure (10)

Figure (11)



Δ ABD $\equiv$ Δ ACD

where :

1) AB = AC

2) BD = CD

3) $\overline{AD}$ is a common side

Geom.

Sheet (1)

[1] Mention the type of angle whose measure is as following :

1) 57° 2) 117° 3) 90°

4) 180° 3) $43\frac{1}{2}$ 6) 89° 59´ 60´´ 7) 179° 62´

[2] Complete :

1) The angle is ……………………..
2) The measure of straight angle …………………
3) The measure of zero angle ……………………
4) The measure of right angle ……………………
5) The measure of acute angle is less than ……………and more than ………………..
6) The measure of obtuse angle is less than more than ……………..
7) The two complement angles are two angles whose sum of their measure is ……………..
8) The two supplement angles are the two angles whose sum of their measure is ………….
9) The two adjacent angles formed by straight line and ray with same stating point are ……………….
10) If the two outer sides of two adjacent angles are perpendicular , then these two adjacent angles are ……………….
11) If the two outer sides of two adjacent angles are on the same straight line , then these adjacent angles are ……………………
12) The measure of angle which complement with 48° is …………………
13) The measure of angle which complement with 90° is ……………….
14) The measure of angle which complement with $60°\frac{1}{4}$ is ………………
15) Measure of angle which supplementary with 90° is ……………angle .
16) Measure of angle which supplementary with 180° is …………..angle .

17) Measure of angle which supplementary with 48° .

18) If two straight lines intersect then the measure of each two vertically opposite angle are ………………….

19) The sum of measure of accumulative angles at point ………………

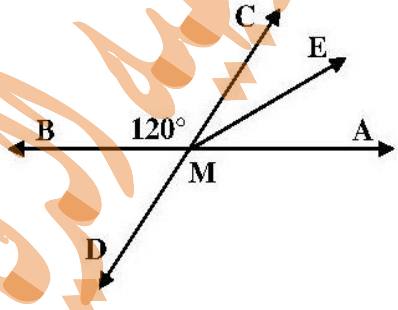
20) Angle bisector is ……………….

21) If m (A) = 80 then (reflex ∠A) = …………..°

22) In opposite figure :

a) M is the point intersection of $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$, $\overrightarrow{ME}$ bisects ∠ AMC and m (∠BMC) = 120° . Find :

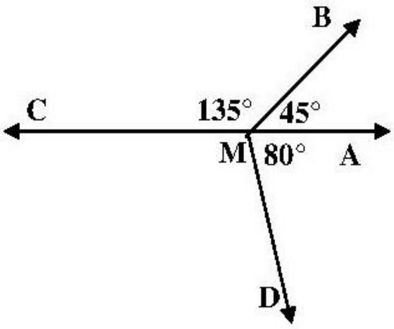
m (∠AMC) , m (∠AMD) , m (∠AME)



b) In the figure :

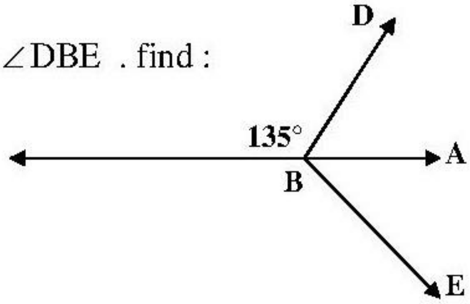
1) m (∠CMD) = ……….°

2) …………..and …………lie on the same straight line .



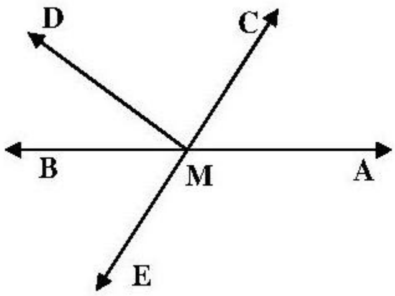
c) If B ∈ $\overleftrightarrow{AC}$, m (DBC) = 135° and $\overrightarrow{BA}$ bisects ∠DBE . find :

m (ABD) , m (DBE) , m (CBE)



d) If $\overleftrightarrow{AB}$ ∩ $\overleftrightarrow{CE}$ = {M} , $\overrightarrow{MD}$ ⊥CE and $\overrightarrow{MB}$ bisects ∠DME . Find :

m (∠BME) , m (DME) , m (∠AMC) , m (AME)



Sheet (2)

[1] Complete :

1) The two line segment are congruent if …………..
2) The two angles are congruent if ……………..
3) The two square are congruent if ……………..
4) The two rectangle are congruent if …………

[2] In the opposite figure :

The two pentagons shown are congruent

Complete :

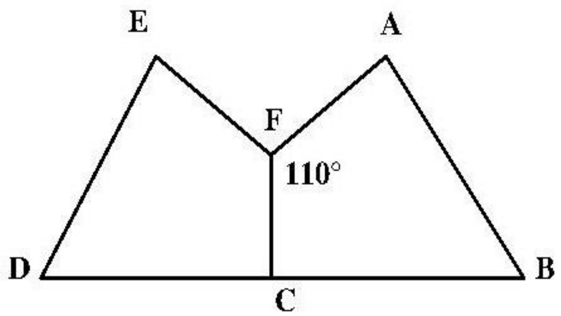
1) B correspond to …………………..
2) The polygon BLACK is congruent the polygon ……………..
3) KB = …………… cm.
4) M (∠E) = m (∠…………)
5) CA = …………cm
6) M (∠A) = m (……)

[3] In the opposite figure :

If C ∈ BD , m (AFC) = 110° , BC = 5 cm and polygon ABCF ≡ the polygon EDCF

ED = 8 cm , EF = 4 cm .

Complete :



M (EFC) = ………..

DC = ……….cm

AB = ………..   AF = ………..

Sheet (3)

1) Draw the line segment whose length 7 cm. then divid it into two equal parts in length using the compass and the an scaled ruler .

2) Draw $\angle ABC$ where $m(\angle B) = 80°$ using the ruler and compasses bisect $\angle B$ by $\overrightarrow{BD}$

3) Use the ruler and compasses to draw the equilateral ΔABC of side 6 cm . Draw $\overline{AD} \perp \overrightarrow{BC}$ where $\overrightarrow{AD} \cap \overline{BC} = \{D\}$. what the length of $\overline{AD}$.

4) Draw $\angle XYZ$ whose measure $70°$ use ruler and draw congruent equal to it .

5) Using the protractor , draw $\angle ABC$ with measure $70°$ and on the other side of BA , draw using ruler and compasses draw $\overrightarrow{AE} // \overrightarrow{BC}$.

Sheet (4)

[1] Complete the following :

1) Any two triangle s are congruent if two sides ………………

2) Any two triangles are congruent if two angles and ……………in one of the triangles are congruent to their corresponding element in the other .

3) Any two triangles are congruent if each …………is congruent to its corresponding side in the other triangle .

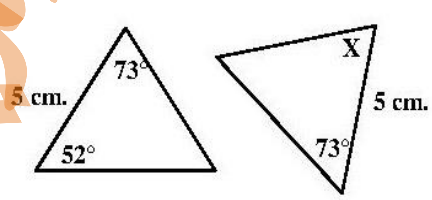
4) Any two right – angled triangles are congruent if ……………..

5) The diagonal of the rectangle divides its surface into two …………..triangles .

6) If Δ ABC ≡ Δ XYZ , then AB = …………and m (∠Z) = m (∠………)

[2] In the opposite figure :

These triangles are congruent , then X = ……….°



[3] In the opposite figure :

If AB = AD , BC = 7 cm. , m (∠BAC) = m (∠DAC) = 25° and m (∠B) = 30°

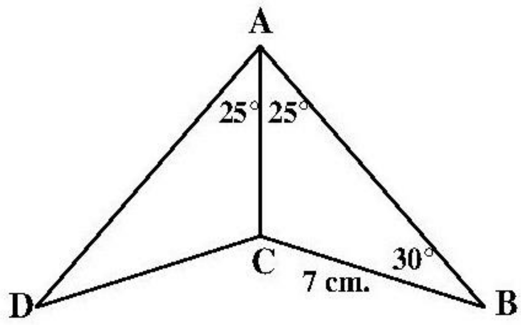
Complete the following :

If Δ ACB ≡ Δ ACD

1) m (∠D) = …………°

2) CD = ……….cm.

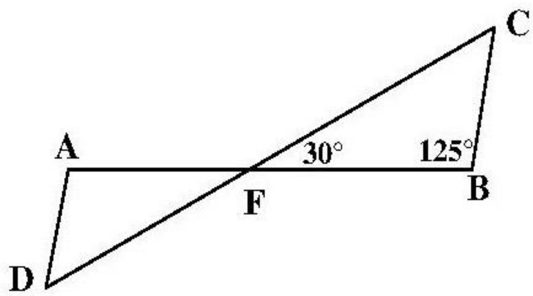
3) m (∠ACD) = ………°



[4] In the opposite = {F} , FA = FB , CF = FD ,

m (∠CFB) = 30° and m (∠B) = 125° ,

Then m (∠D) = ……….°



[5] In the opposite figure :

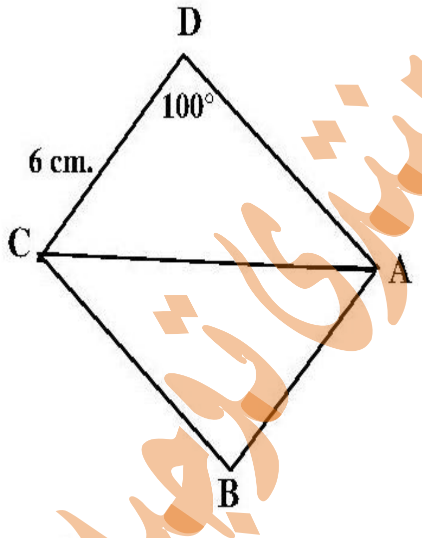
If $\overleftrightarrow{AC}$ bisects $\angle DCB$, $\angle DAB$, m ($\angle D$) = 100°

And DC = 6 cm. complete the following :

1) Δ ADC ≡ Δ ……………

2) m ($\angle B$) = ……………

3) BC = …………cm .

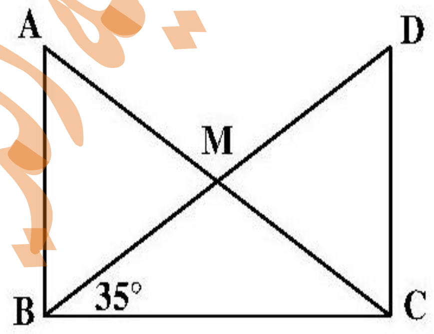


[6] In the opposite figure :

AB = CD , m ($\angle DBC$) = 35° ,

$\overline{AB} \perp \overline{BC}$ and $\overline{DC} \perp \overline{BC}$,

Then m ($\angle BMC$) = ……………



[7] In the opposite figure :

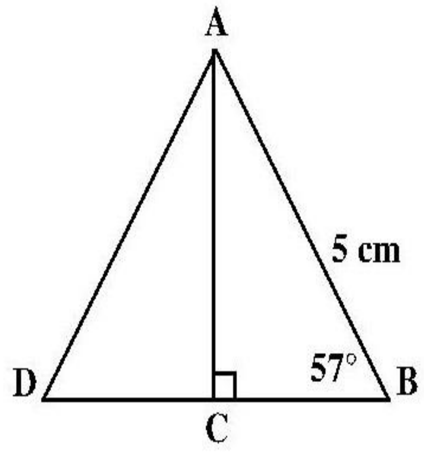
C is the midpoint of $\overline{BD}$, $\overline{AC} \perp \overline{BD}$,

AB = 5 cm. , and m ($\angle B$) = 57°

Find :

1) The length of $\overline{AD}$

2) m ($\angle DAC$)

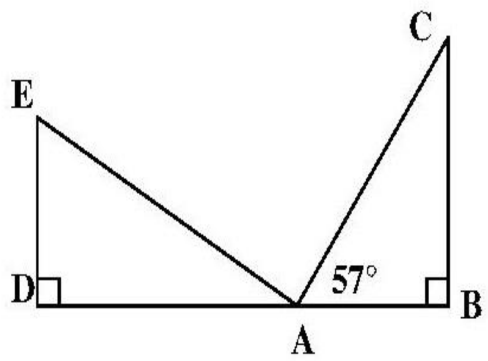


[8] In the opposite figure :

BC = AD , AC = AE

And m ($\angle CAB$) = 57°

Find the measures of the unknown angles in Δ ADE



Sheet (5)

[1] Complete the following :

1) If two straight lines are parallel to a third straight line , then they are ……………

2) If a straight line cuts two parallel straight lines , then each two corresponding angles are …………….

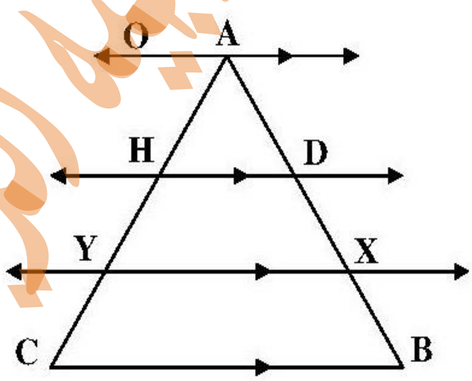
3) If a straight line cuts two parallel straight lines , then each two interior angles in the same side of the transversal are ………………

[2] In the opposite figure :

$\overline{AO} \parallel \overleftrightarrow{HD} \parallel \overleftrightarrow{YX} \parallel \overline{CB}$

, AD = DX = XB and AC = 18 cm.

Find the length of AY



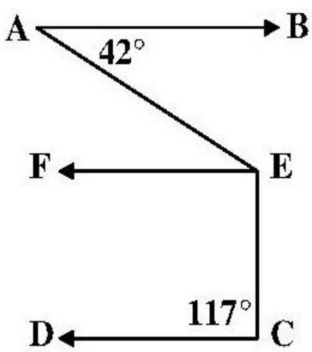
[3] In the opposite figure :

$\overrightarrow{AB} \parallel \overrightarrow{CD}$, $\overrightarrow{EF} \parallel \overrightarrow{CD}$

, m (∠A) = 42° and m (∠C) = 117°

Determine :

m (∠AEC)



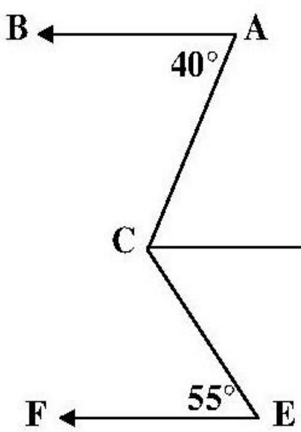
[4] In the opposite figure :

m (∠A) = 40° , m (∠E) = 55°

$\overrightarrow{AB} \parallel \overrightarrow{EF}$ and $\overrightarrow{AB} \parallel \overrightarrow{CD}$

Find :

M (∠ACE)

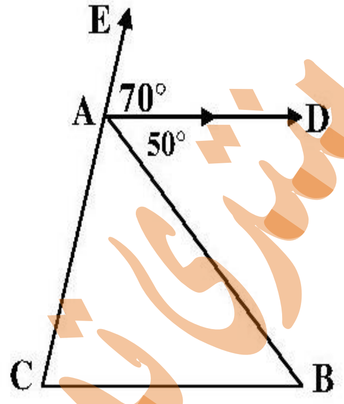


[5] In the opposite figure :

$\overrightarrow{AD} \parallel \overline{BC}$, $E \in \overrightarrow{CA}$,

$m(\angle DAE)$ 70° and $m(\angle DAB) = 50°$

Find the measures of the triangle ABC



[6] In the opposite figure :

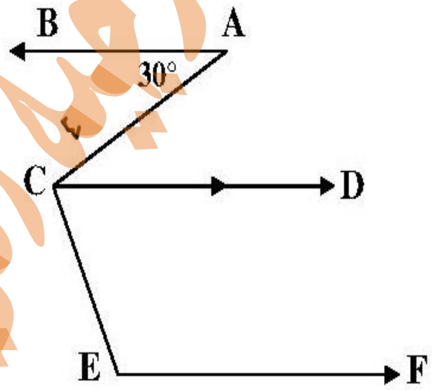
$\overrightarrow{AB} \parallel \overrightarrow{CD} \parallel \overrightarrow{EF}$, $m(\angle A) = 35°$ and

$\overrightarrow{CD}$ bisects $\angle ACE$

Find :

1) $m(\angle DCE)$

2) $m(\angle CEF)$

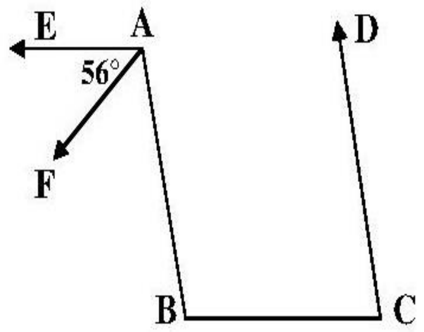


[7] In the opposite figure :

$\overline{AE} \parallel \overline{CB}$, $\overline{BA} \parallel \overline{CD}$,

$\overrightarrow{AF}$ bisects $\angle BAE$ and $m(\angle EAF) = 56°$

Find : $m(\angle C)$



[8] In the opposite figure :

$\overline{XL} \parallel \overline{YZ}$, $\overline{XY} \parallel \overline{LZ}$ and $m(\angle XYM) = 100°$

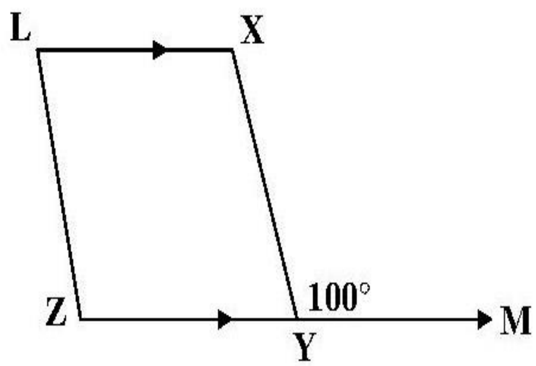
Where $M \in \overrightarrow{ZY}$

Find :

1) $m(\angle X)$

2) $m(\angle Z)$

3) $m(\angle L)$



Geometric concepts

The line segment

The straight line

The ray

[1] In the opposite figure :

A , B ,C and D are points lying on one line , $\overleftrightarrow{AD} \cap \overrightarrow{BE} = \{B\}$

Complete each of the following by using $\in$,$\notin$,$\subset$ or $\not\subset$:

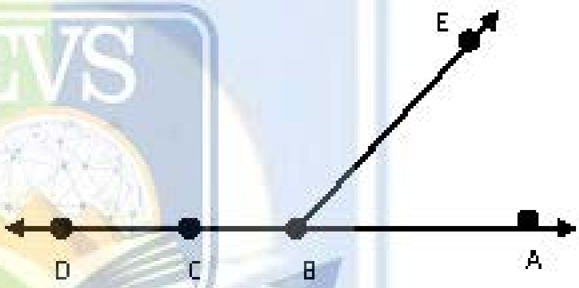
1) A $\boxed{\quad}$ $\overrightarrow{DC}$

2) C $\boxed{\quad}$ $\overleftrightarrow{AB}$

3) $\overline{DC}$ $\boxed{\quad}$ $\overleftrightarrow{AB}$

4) A $\boxed{\quad}$ $\angle EBC$

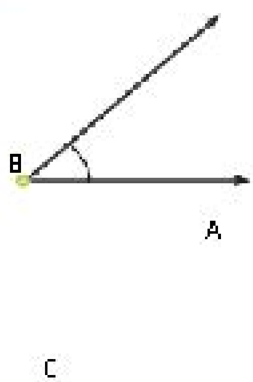
5) $\overline{AC}$ $\boxed{\quad}$ $\overline{AD}$



The angle: is the union of two rays having the same starting point.

*The common point of the two rays is called the **vertex** of the angle. (B)

*Each of the two rays is called a **side** of the angle. **($\overrightarrow{BA}$, $\overrightarrow{BC}$)**



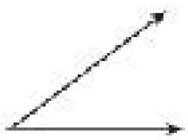
* The Types of angles

1) ***Zero angle***:

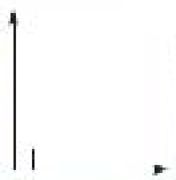
- Its measure = 0°

2) ***Acute angle***:

- Its measure is more than 0° and less than 90°



3) Right angle:



- Its measure = 90°

4) ***Obtuse angle***:

- Its measure is more than 90° and less than 180°

5) ***Straight angle***:

- Its measure = 180°

6) ***Reflex angle***:

- Its measure is more than 180° and less than 360°

[1] Mention the type of each of the following angles:

a) 57° ………………………

b) 90° ………………………

c) 89° ………………………

d) 270° ………………………

e) 0° ………………………

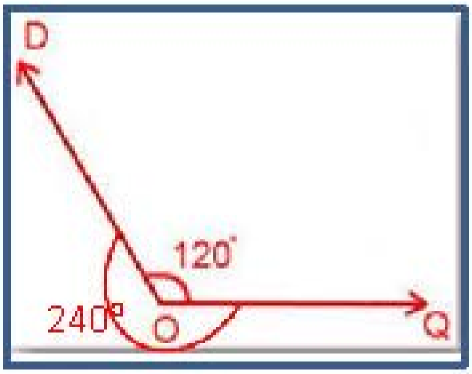
f) $90\frac{1}{2}^\circ$ ………………………

g) $65^\circ 15'$ ………………………

h) $89^\circ\ 70'$ ………………………

Remark

In the opposite figure :



m(∠QOD) +m(reflex∠QOD)

$120° + 240° = 360°$

[2] complete:

a) The angle whose measure is 25°, its type is ....

b) The angle whose measure is 179° 60', its type is ....

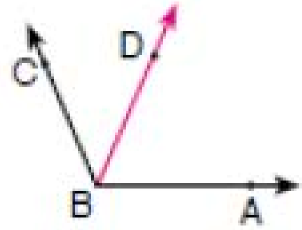
c) If $m(\angle B) = 160°$, then m(reflex∠B) = ... °

[3] Draw the following angles :

a) 115°	b) 80°	c) 300°

*Some relations between the angles

1) Adjacent angles:



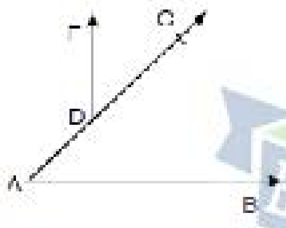
Two angles are said to be adjacent if they have:

a common vertex,

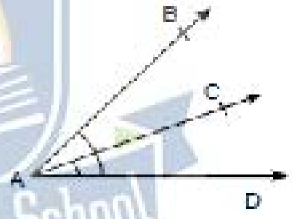
a common side and the other two sides are on opposite sides of the common side.

∠ABD, ∠DBC are adjacent

[1] Which of the following angles are adjacent ? (give reason)



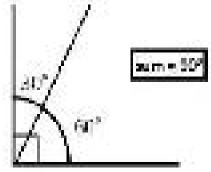
∠BAC and ∠EDC



∠BAC and ∠BAD

Complementary angles:

Two angles are said to be complementary if their sum is 90º.



complementary angles

[2] Complete:

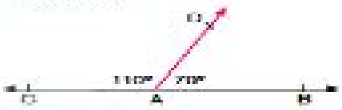
1) The angle of measure 40° complements angle of measure .... °

2)The acute angle complements ....angle

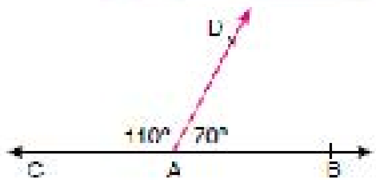
3) Zero angle is complemented by ....angle

Supplementary angles:

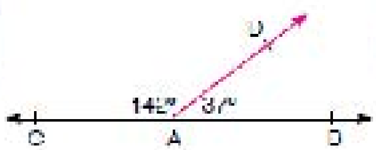
Two angles are said to be supplementary if the sum of their measure is 180°



[3] Which of the following represent supplementary angles? Give reason.



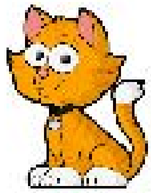
(1)



(2)

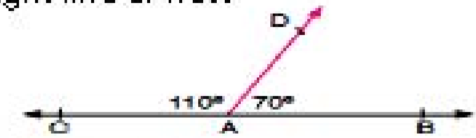
[4]Complete:

1) The angle of measure $80°$ supplements angle of measure ……..
2) The obtuse angle supplements ……… angle.



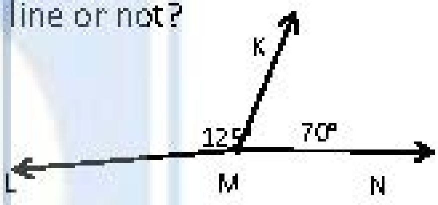
[5]In the opposite figure:

Find if: $\angle CAD$ and $\angle BAD$ are on the same straight line or not?



[6]In the opposite figure:

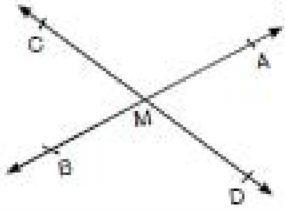
Find if: $\angle KML$ and $\angle KMN$ are on the same straight line or not?



[7] If the ratio between two supplementary angles is 7 : 11, then the measure of the smaller angle is : ………..

***Vertically opposite angles (V.O.A)*:**

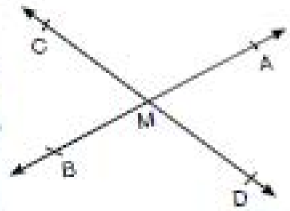
If two straight lines intersect, then each two vertically opposite angles are equal in measure



[1] Complete:

1) The angle whose measure is 46 ° is vertically opposite to an angle whose measure is ………………

2) The right angle is vertically opposite angle to ……………

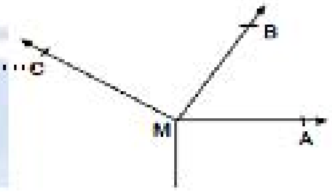


3) The two angles AMD, BMC are called ………………….

Accumulative angles at a point:

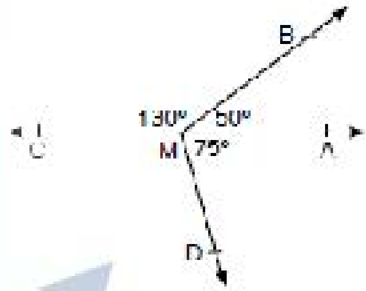
The sum of the measures of the accumulative angles at a point is 360°

1) m (∠AMB) + m (∠BMC) + m (∠CMD) + m (∠DMA) = ……



*Find:

m(∠CMD) = ………°

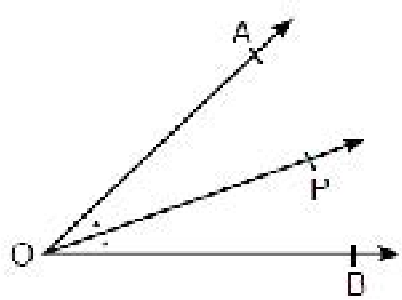


The angle bisector:

It is the ray that divides the angle into two halves (two equal angles in measure)

[1] $\overrightarrow{OP}$ divides ∠ AOB into two angles having the same measure and $\overrightarrow{OP}$ is called the bisector of ∠AOB.

Then m(∠ AOP) = m(∠BOP)

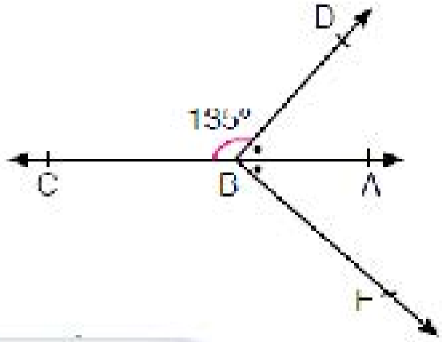


[2] In the figure opposite,

If B ∈ $\overleftrightarrow{AC}$, m (∠DBC) = 135º and

$\overrightarrow{BA}$ bisects ∠DBE find:

m (∠ABD), m (∠DBE), m (∠CBE)



………………………………………………

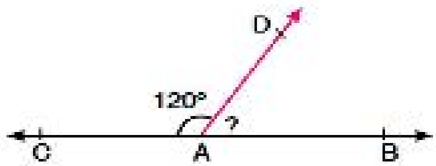
………………………………………………

………………………………………………

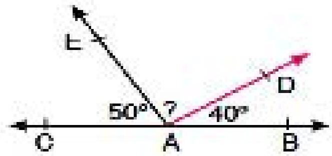
………………………………………………

Try by yourself

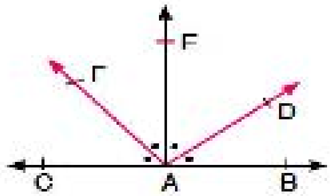
[1]Find the measure of each of the following unknown angles:



m (∠BAD) = ...°

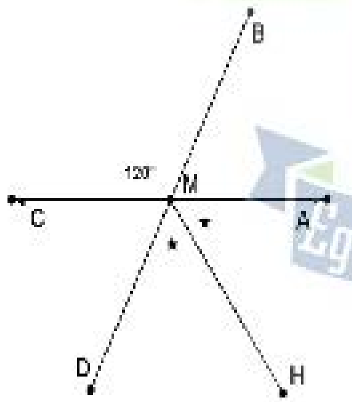


m (∠DAE) = ...°

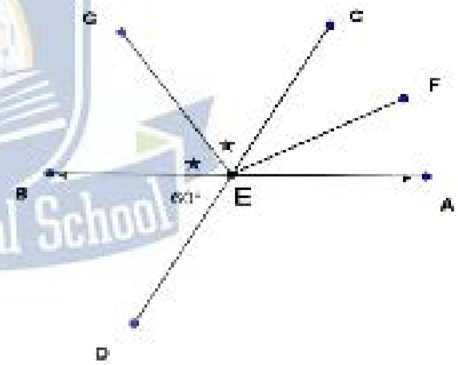


m (∠BAD) = ...°

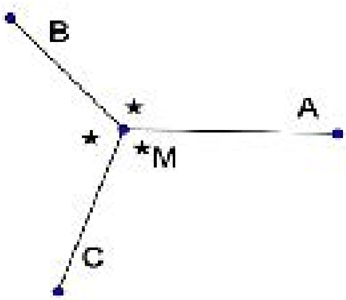
[2] In each of the following figures , find the measure of the required angles:



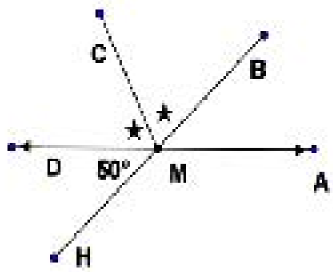
m(∠HMD) = ...



m (∠GEB) = ……………..°

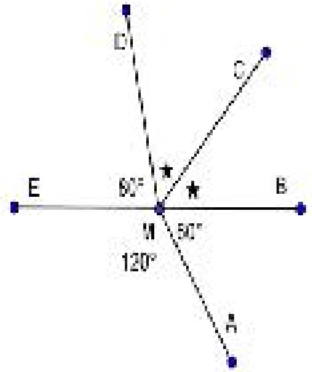


m(∠AMC) = ……….



m (∠AMC) = …………..°

2) In the opposite figure :



m (∠ A M B) = 60° , m (∠ A M E) = 120° ,

m (∠ E M D) = 80°

and $\overrightarrow{MC}$ bisects ∠ B M D

Find :

1) m (∠ C M D) 2) m (∠ A M C)

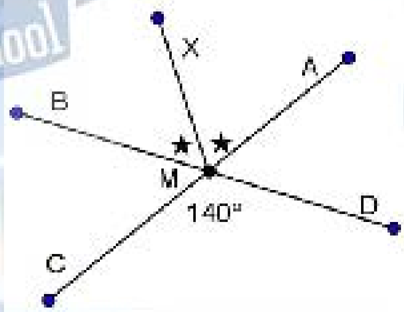
....

....

....

....

3) In the opposite figure :



$\overleftrightarrow{AC} \cap \overleftrightarrow{BD}$ = { M } , $\overrightarrow{MX}$ bisects ∠ AMB

and m (∠ C M D) = 140 °

Find : m (∠ D M X)

....

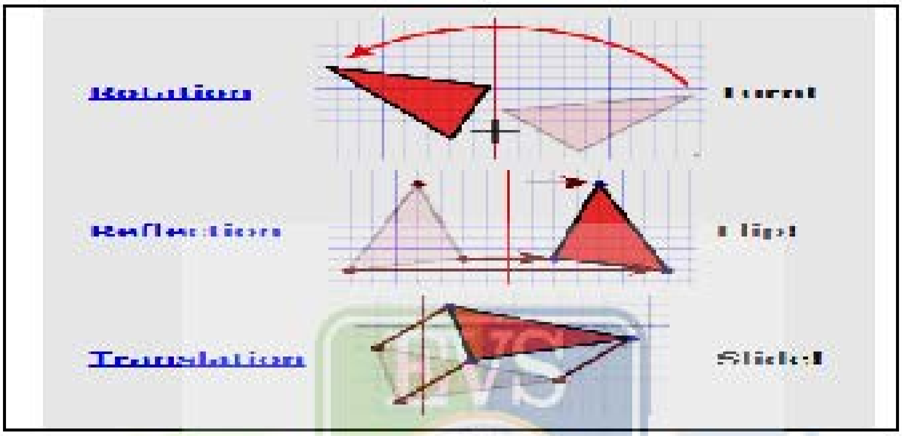
....

....

....

Congruence

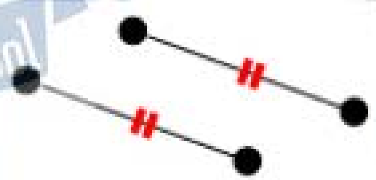
*If one shape can become another using Turns, Flips or Slides, then the shapes are **Congruent**.



[1]Congruence of two line segments:

*Two line segments are congruent if they are equal in length.

Complete:

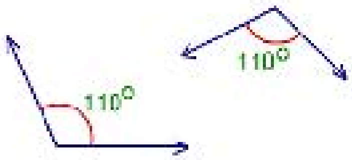


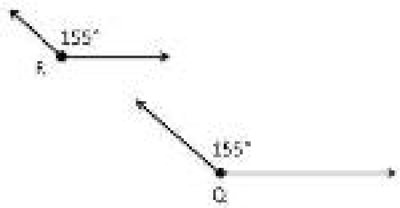
1) If $\overline{AB} \equiv \overline{CD}$, Then AB ……… CD

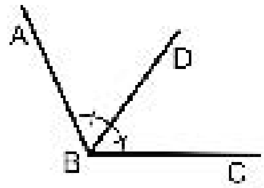
2) If $\overline{AB} \equiv \overline{CD}$,Then AB – CD = ………..

[2]Congruence of two angles:

*Two angles are congruent if they are equal in measure.







Complete:

1) If $\angle A \equiv \angle B$,and $m(\angle A) = 50°$,then $m(\angle B) = ...°$

2) If $\angle A$ complements $\angle B$, and $\angle A \equiv \angle B$,and $m(\angle A) = 50°$,then $m(\angle B) = ...°$

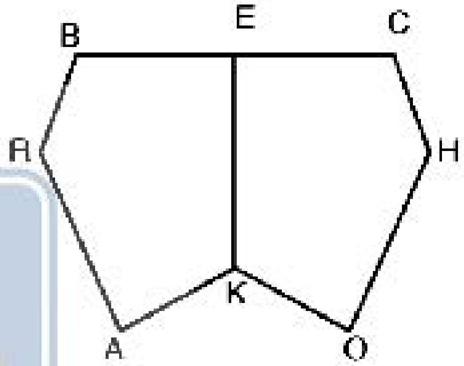
[3]Congruence of two polygons :

*Two polygons are congruent if there is a correspondence between the vertices such that :

1) Corresponding sides are equal in length.

2) Corresponding angles are equal in measure.

Example(1):



The polygon BRAKE is congruent to the polygon CHOKE, the vertices are written in the same order.

Complete:

CH = …… , EK = ……

HO = …… , EC = ……

KO = …… , KE is a common side

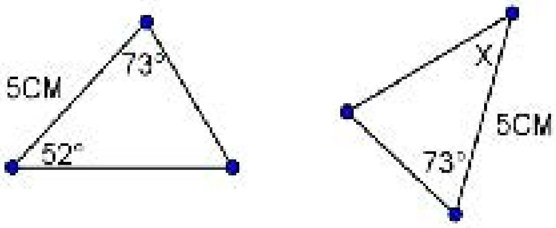
m (∠C) = m (∠……), m (∠ OKE) = m (∠ ……)

m (∠H) = m (∠ ……), m (∠KEC) = m (∠……)

m (∠O) = m (∠ ……)

Example(2):

In the opposite figure :



These triangles are congruent ,

then X = ………………°

Example(3):

a) The diagonal of the rectangle divides its surface into two …………… triangles .

b) If Δ A B C $\equiv$ Δ X Y Z , then A B = …… and m ($\angle$Z) = m (…..)

c)If c is the midpoint of $\overline{AB}$, Then $\overline{AC}$ ……….. $\overline{BC}$

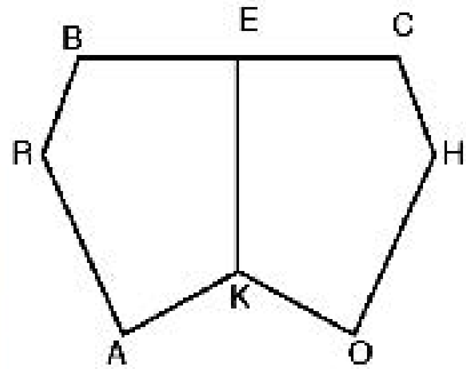
d) The two squares are congruent if …………are equal .

e) The two rectangles are congruent if …………. are equal.

Try by yourself

[1] The polygon BRAKE is congruent to the polygon CHOKE, the vertices are written in the same order.

***Complete:**



CH = …… , EK = ……

HO = …… , EC = ……

KO = …… , KE is a common side

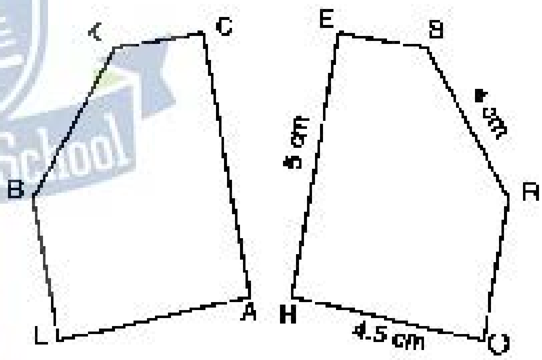
m (∠C) = m (∠……), m (∠ OKE) = m (∠……)

m (∠H) = m (∠……), m (∠KEC) = m (∠……)

m (∠O) = m (∠……)

[2] The two pentagons shown are congruent.

Complete



[a] B Corresponds to ……

[b] The polygon BLACK is congruent to the polygon…….

[c] KB = …… cm.

[d] m (∠E) = m (∠……)

[e] CA = …….

[f] m (∠ A) = m (∠……)

[3] Complete:

a) The diagonal of the rectangle divides its surface into two ………….. triangles.

b) If Δ A B C ≡ Δ X Y Z , then A B = ………….. and

m (∠ Z) = m (…………)

Congruent Triangles

The first case of congruence of two triangles (side – angle – side) (S.A.S)

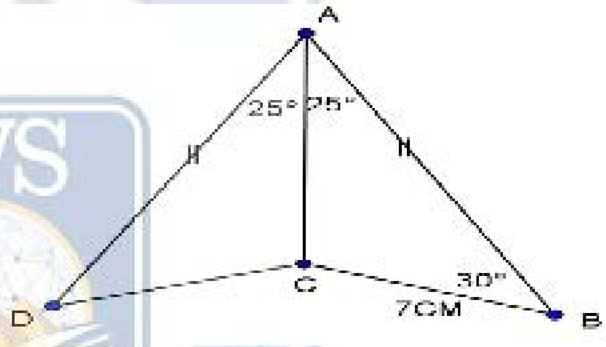
Two triangles are congruent if two sides and the included angle of one triangle are congruent to the corresponding parts of the other triangle.

Example 1 :

If A B = A D = , B C = 7 cm . ,

m(∠ B A C) = m (∠ D A C) = 25°

And m(∠ B) = 30°



Complete the following :

1) Δ A C B ≡ Δ ………….

2) m (∠ D) = …………

3) C D = ………….. cm

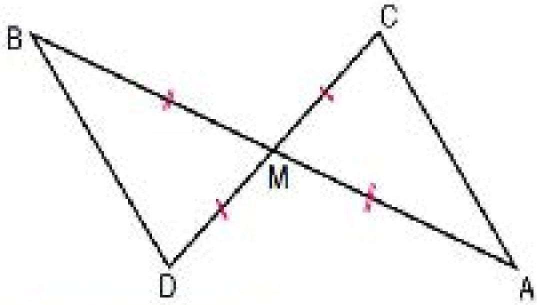
4) m (∠ A C D) = ……….

Example 2:

In the figure opposite,

$AB \cap CD = \{M\}$, $AM = BM$, and $CM = DM$.

Does $\Delta AMC \equiv \Delta BMD$? why?



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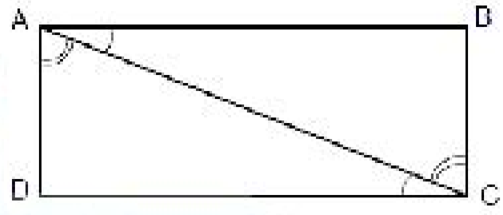
The second case of congruence of two triangles (angle – side – angle) (A.S.A)

Two triangles are congruent if two angles and the side drawn between their vertices of one triangle are congruent to the corresponding parts of the other triangle



[1] In the opposite figure:

Find that $\Delta ABC \equiv \Delta CDA$

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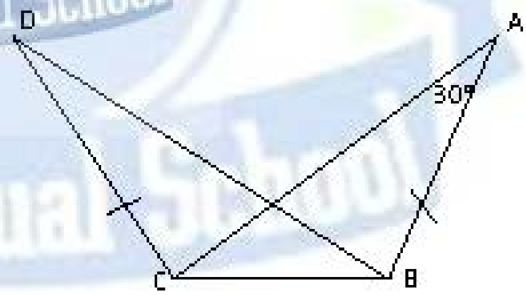
[2]In the opposite figure:



If AB =DC , AC=DB and $m(\angle A) = 30°$,

Complete:

1) $\Delta ABC \equiv \Delta$ …………

2) $m(\angle D) =$ ………..°

3) $m(\angle DBC) = m(\angle$……..)

Important note

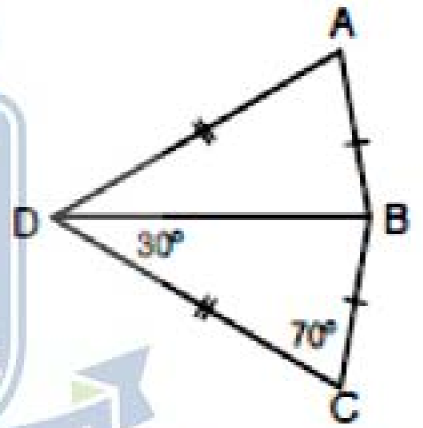
*The diagonal of the rectangle divides its surface into two **congruent** triangles .

[1] mention two cases of congruency of two triangles.

[2] In the figure opposite :

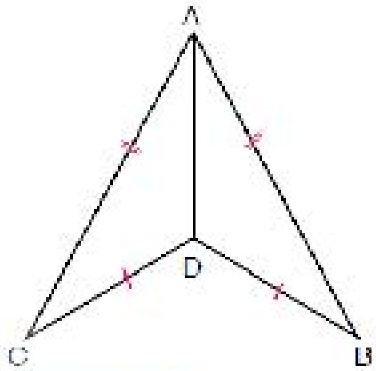
$AB = BC$, $AD = CD$, $m(\angle C) = 70°$,

$m(\angle BDC) = 30°$. find $m(\angle ABD)$.



The third case of congruence of two triangles (side – side – side) (S.S.S)

Two triangles are congruent if each side of one triangle is congruent to the corresponding side of the other triangle



[1] In the figure opposite,

AB = AC , BD = CD

Is $\Delta ADB \equiv \Delta ADC$

verify that: $\overrightarrow{AD}$ bisects $\angle A$

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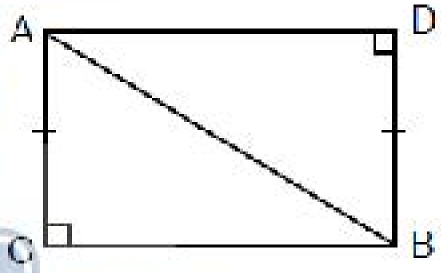
<u>The fourth case of congruence of two triangles(Hypotenuse and one side in the right – angled triangle R.H.S)</u>

Two right – angled triangles are congruent if the hypotenuse and a side of one triangle are congruent to the corresponding parts of the other triangle

[1] In the figure opposite:

Find the two congruent triangles.



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* Mark (✓) for the correct statement:

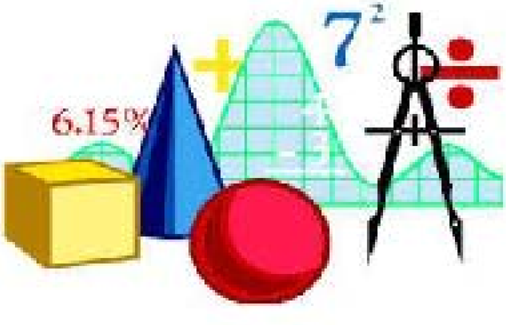
[a] Two triangles are congruent if the lengths of sides of one triangle are equal to the corresponding parts of the other.

[b] Two triangles are congruent if the measures of the angles of one triangle are equal to the measures of the corresponding parts of the other.

[c] Two right- angled triangles are congruent if the lengths of two sides of One triangle are equal to the corresponding parts of the other triangle.

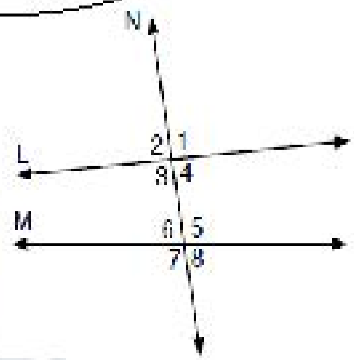
[d] Two right- angled triangles are congruent if the length of the hypotenuse and the measure of an angle differs from the right angle are equal to the corresponding parts of the other triangle.

[e] Two right- angled triangles are congruent if the length of the hypotenuse and the length of a side of one triangle are equal to the corresponding parts of the other triangle.



Parallelism

*** If a straight line intersects two parallel straight lines, then:**



1) Every two alternate angles are equal in measure.

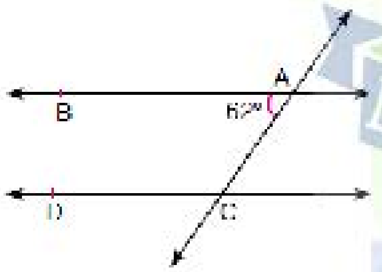
2) Every two corresponding angles are equal in measure.

3) Every two interior angles on one side of the transversal are supplementary.

---

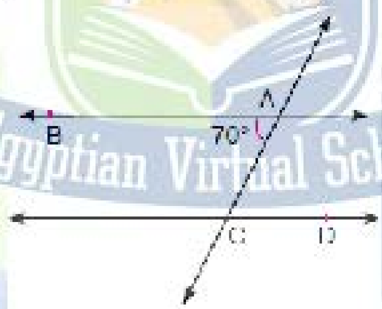
[1] Complete:

a)



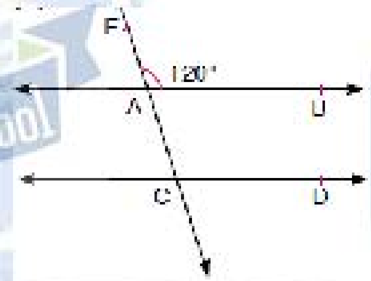
$m(\angle ACD) = ...° \quad .....°$
$= .....°$

b)



$m(\angle ACD) = m(\angle .....)$
$= .....°$

c)



$m(\angle ACD) = m(\angle .....)$
$= .....°$

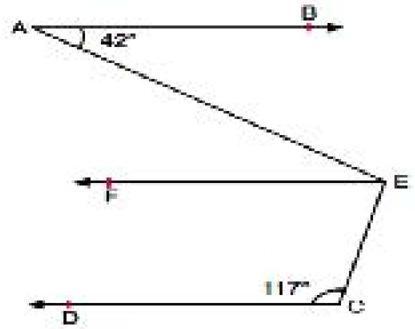
---

[2] In the figure opposite,

$\overrightarrow{AB} // \overrightarrow{CD}$, $\overrightarrow{EF} // \overrightarrow{CD}$,

$m(\angle A) = 42°$, and $m(\angle C) = 117°$

Determine $m(\angle AEC)$



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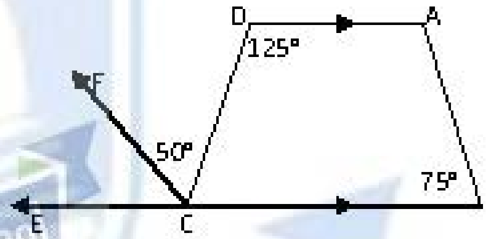
[3] In the opposite figure:

$\overline{AD} // \overrightarrow{BC}$, $E \in \overrightarrow{BC}$,

$m(\angle B) = 75°$, $m(\angle D) = 125°$ and $m(\angle DCF) = 50°$

Is $\overrightarrow{AB} // \overrightarrow{CF}$? why?



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Try by yourself:

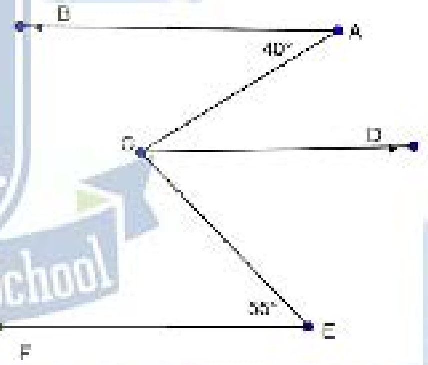
1) If two straight lines are parallel to a third straight line , then they are

....

2) If a straight line cuts two parallel straight lines , then each two corresponding angles are ....

3) If a straight line cuts two parallel straight lines , then each two interior angles in the same side of the transversal are ....

4) In the opposite figure :



m ($\angle$A) = 40° , m ($\angle$E) = 55°

$\overrightarrow{AB}$ // $\overrightarrow{EF}$ and $\overrightarrow{AB}$ // $\overrightarrow{CD}$

Find :

m ($\angle$ ACE)

....

....

....

....

....

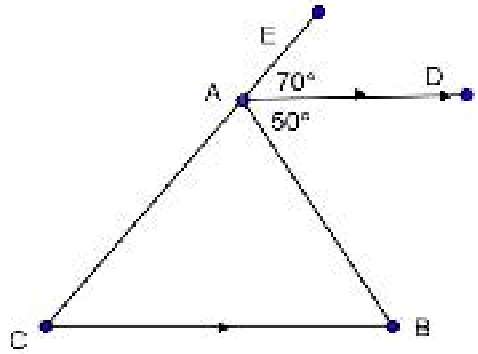
....

5- In the opposite figure :

$\overrightarrow{AD} \parallel \overline{BC}$, $E \in \overrightarrow{CA}$,

m ($\angle DAE$) = 70° and m ($\angle DAB$) = 50°

Find the measures of the angles of the triangle A B C



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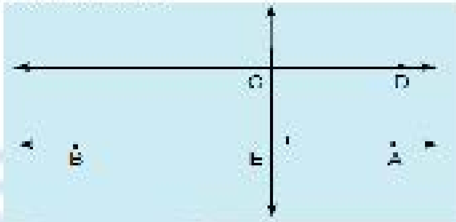
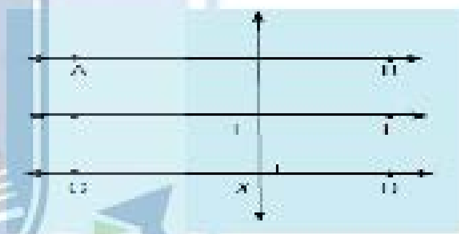
Important

1) A straight line that is perpendicular to one of two parallel lines is also perpendicular to the other.

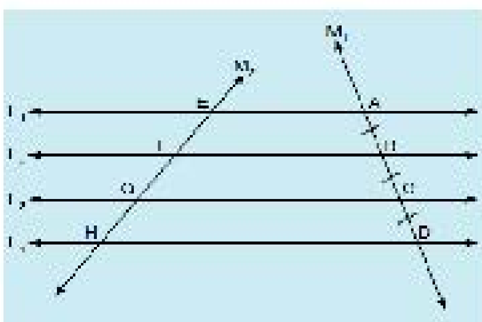


2) If each one of two straight lines is perpendicular to a third line in a plane, then the two straight lines are parallel.



3) If two straight lines are parallel to a third straight line, then these two straight lines are parallel to each other.

4) If Parallel straight lines divide a straight line into segments of equal lengths, then they divide any other straight line into segments of equal lengths



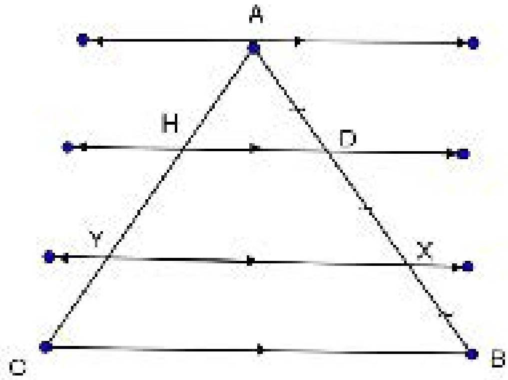
[1] **In the opposite figure :**

$\overline{AO} // \overleftrightarrow{HD} // \overleftrightarrow{YX} // \overline{CB}$

, A D = D X = X B

and A C = 18 cm.

Find the length of $\overline{AY}$



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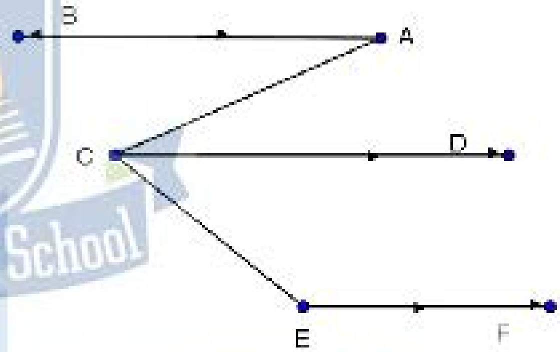
[2] **In the opposite figure :**

$\overrightarrow{AB} // \overrightarrow{CD} // \overrightarrow{EF}$, m (∠ A) = 35° and

$\overrightarrow{CD}$ bisects ∠ A C E



Find :

1) m (∠ D C E)

2) m (∠ C E F)

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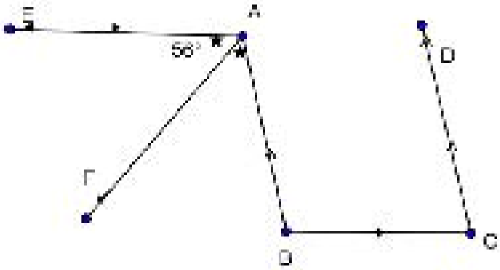
[3] In the opposite figure :

$\overline{AE} // \overline{CB}$, $\overline{BA} // \overline{CD}$,

$\overrightarrow{AF}$ bisects $\angle BAE$ and m ($\angle EAF$) = 56°

Find : m ($\angle$ C)



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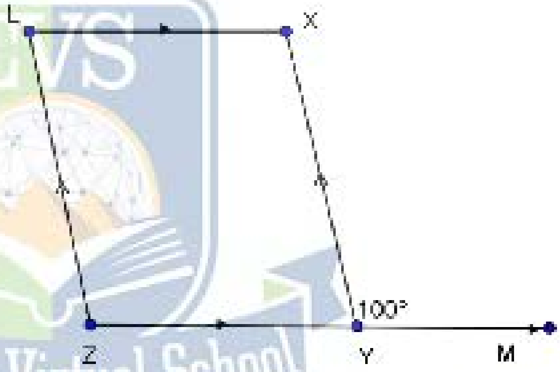
[4] In the opposite figure :

$\overline{XL} // \overline{YZ}$, $\overline{XY} // \overline{LZ}$ and

Where $M \in \overrightarrow{ZY}$

Find :



1) m ($\angle$ X)

2) m ($\angle$ Z)

3) m ($\angle$ L)

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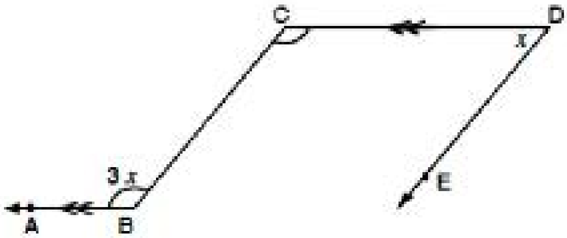
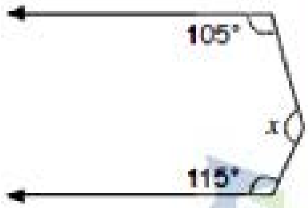
[5] In the opposite figure, if $\overline{CD} // \overrightarrow{BA}$ and $\overrightarrow{DE} // \overline{CB}$, then x = ……°

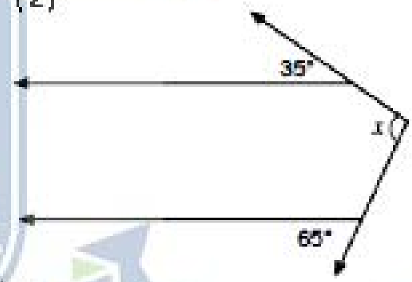


[6] Find the measure of ($\angle X$) in each of the following:

(1)



(2)

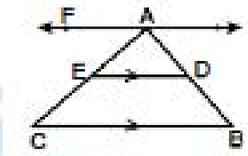


[7] Choose the correct answer:

(1) If two straight lines are on the same plane and do not intersect, then they are ………………………………

(a) skew (b) perpendicular (c) parallel (d) congruent

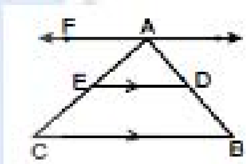
(2) In the opposite figure :



AD : DB = ……….

(a) 1 : 1 (b) 1 : 2 (c) 1 : 3 (d) 1 : 4

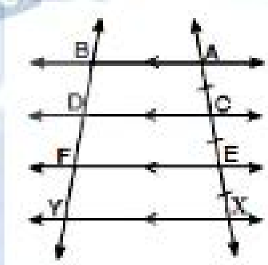
(3) In the opposite figure :



AD : AB = ……….

(a) 1 : 1 (b) 1 : 2 (c) 1 : 3 (d) 1 : 4

(4) In the figure opposite :



If BF = 2 cm then BY = ……….. cm

Geometric Constructions

1) Using the geometric instruments , draw an angle of measure 120°

   and bisect it   (Don't remove the arcs)

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2) Using the geometric instruments , draw an angle of measure 120°

   and divide it into four congruent angles   (Don't remove the arcs)

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3) Draw an angle whose vertex is A and its measure is $130°$, use a ruler and a compasses to divide the angle A into 4 equal angles in measure

(Don't remove the arcs).

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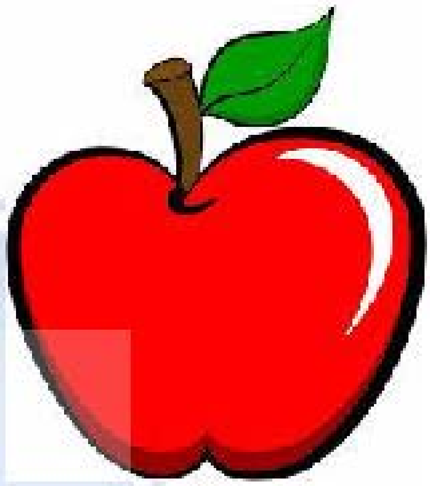

4) Using the ruler and the compasses , draw $\triangle$ A B C in which

A B = A C = 5 cm , B C = 6 cm , then draw $\overline{AD} \perp \overline{BC}$ where

$\overline{AD} \cap \overline{BC} = \{D\}$. Then find the length of A D

(Don't remove the arcs)

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5) Using the ruler and the compasses , draw $\triangle$ A B C in which

A B = A C = 3 cm, B C = 5 cm then bisect $\angle$ A by the bisector

$\overline{AD}$ where D $\in$ $\overline{BC}$ (Don't remove the arcs) .

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5) Using the ruler and the compasses , draw $\triangle$ XYZ in which:

$m(\angle X)=50^o$, $m(\angle Y) = 70^o$,then draw $\overline{ZL} \perp \overline{XY}$ to cut it at L.

then find:

1) The length of $\overline{ZL}$

2)The area of $\triangle$XYZ

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6) Using the ruler and the compasses, draw the equilateral triangle ABC of side length 6cm. Bisect each of   A,   B and   C to intersect at M .prove that MA = MB = MC

(Don't remove the arcs)

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7) Using the geometric instruments, Draw AB where AB = 6 cm, Draw the axis of symmetry of AB, take C ∈ the axis of symmetry and of distance 4 cm from AB.What is the type of Δ ABC according to its sides?

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8) Using the ruler and the compasses, Draw Δ ABC in which

AB = AC = 5 cm and BC = 6 cm, then draw $\overline{AD} \perp \overline{BC}$ where

$\overline{AD} \cap \overline{BC}$ = {D}, then find by measuring the length of $\overline{AD}$.

(Don't remove the arcs)

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Geometric concepts

[1] Complete each of the following:

3) The angle is ……………………………
4) The measure of the straight angle is ….° and the measure of zero angle is ……°
5) The measure of the right angle = ……°
6) The measure of the acute angle is less than ……° and more than ……°
7) The measure of the obtuse angle is less than ……° and more than ……°
8) The angle whose measure is greater than 180° but less than 360° is called ………..
9) The angle whose measure is 179°, its type is ……….
10) The two complementary angles are two angles whose sum of their measures is …….°
11) The complements of the equal angles in measure are ………..
12) The two supplementary angles are two angles whose sum of their measures is …….°
13) The two adjacent angles formed by a straight line and a ray with a starting point on this straight line are ……………
14) If the two outer sides of two adjacent angles are perpendicular then these two angles are ……………
15) The two adjacent angles are complementary ,then their outer sides are ……….
16) If the two outer sides of two adjacent angles are on the same straight line then these two angles are ……………
17) The two adjacent angles are supplementary ,then their outer sides are ……….
18) The angle of measure 43° complements angle of measure …………..° and supplements angle of measure ………….°
19) The angle of measure ……. complements an angle of measure 50° and supplements angle of measure 140°
20) The acute angle complements ………….angle and supplements ……… angle.
21) Zero angle is complemented by …………angle and supplemented by …………angle.
22) The obtuse angle supplements ……… angle.

23) If two straight lines intersect, then each two vertically opposite angles are ………………

24) The right angle is vertically opposite angle to …………..

25) The measure of an angle which equivalent to two right angles=…..° and it's called ……….

26) If: $m(\angle B) = 160^{\circ}$, then $m($ reflex$\angle B) =$ …………..°

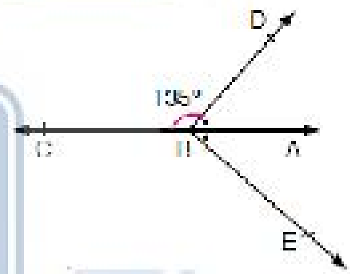
27) If: $\angle A$ supplements $\angle B$ and $\angle A \equiv \angle B$, then $m(\angle B) =$ …………. °

28) the angle whose measure is 46° vertically opposite to an angle whose measure is ………………

29) The sum of the measures of the accumulative angles at a point equals ………

[2] In the figure opposite,

If $B \in \overleftrightarrow{AC}$, $m(\angle DBC) = 135°$ and $\overrightarrow{BA}$ bisects $\angle DBE$ find:
$m(\angle ABD)$, $m(\angle DBE)$, $m(\angle CBE)$



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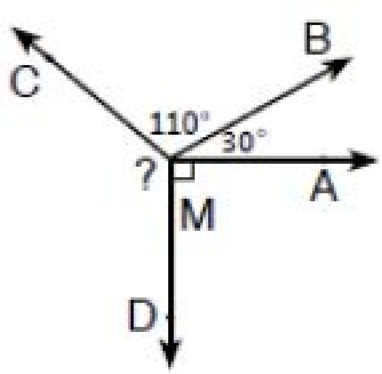
[3] In the figure opposite :

$m(\angle AMB) = 30°$, $m(\angle BMC) = 110°$ and $m(\angle AMD) = 90°$. Find $m(\angle CMD)$.



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The congruency & the congruent triangles

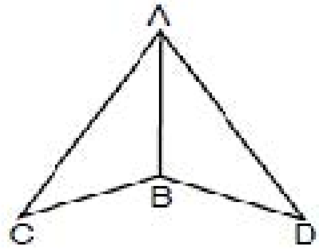
1] Com plete each of the following:

) Two angles are congruent if …………..
) Two line segments are congruent if …………………..
3) Two polygons are congruent if ………………………………………
4) Two polygons are congruent if there is a correspondence between their
vertices such that ....
5) mention two cases of congruency of two triangles.
5) The two adjacent angles formed by a straight line and a ray with a starting point on this straight line are …………..

7) If : $\overline{AB} \equiv \overline{CD}$, then AB – CD = …………..
3) If Z is the midpoint of $\overline{XY}$, then: $\overline{XZ}$ ………….. $\overline{YZ}$
9) If the ratio between two supplementary angles is 4 : 5, then
the measure of the greater angle is ....
0) If m (∠ A) = 2 m (∠ B) , ∠ A complements ∠ B ,
then m (∠A) = ...
1) The two triangles are congruent if …………………………
2) The two triangles are congruent if two sides and .... are congruent with their corresponding in the other triangle.
3) The two triangles are congruent if two angles and .... are congruent with their orresponding in the other triangle.
4) Two right angled triangles are congruent if ………………………...........
5) The diagonal of the rectangle divides its surface into two ………….. triangles .
6) If the two triangles ABC and DEF are congruent, then :BC = ... ,
m (∠ E) = m (∠ ....)
7) If DE = XY, DF = XZ and m (∠ D) = m (∠ X),then ΔΔ .... , ...)
are congruent.
8) The two triangles XYZ and MNL are congruent, if YZ = 8 cm,
m (∠Y) = 40°then in the other triangle : .... = 8 cm , m (∠ ....) = 40°
9) If AB = DF = 5 cm ,AC = DE = 7 cm , m (∠A) = m (∠D) = 55° then
the two triangles ABC ,DFE are congruent with ....
0) In Δ ABC : if m (∠B) = 3 m (∠A) = 90° , then m (∠C) = ...
1) Δ ABC is congruent to Δ XYZ, m (∠A) + m (∠B) = 140°, then
m (∠Z) = ...°

[2] In the figure opposite :

If Δ ABC $\equiv \Delta$ ABD let the perimeter of the figure ACBD = 20 cm and AB = 6 cm, then perimeter of Δ ABC = ……….. cm.



[3] In the figure opposite :

m ($\angle$BAD) = m ($\angle$BCD) = 90°

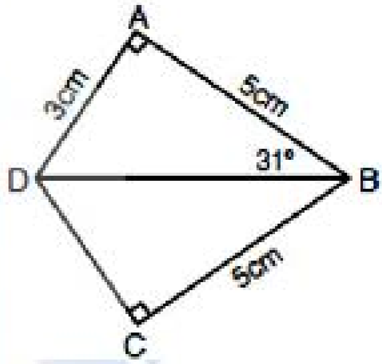
m ($\angle$ABD) = 31°,

AB = CB = 5 cm, AD = 3 cm

(a) Prove that :

the two triangles ABD and CBD are congruent.

(b) find the length of CD.



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The parallelism

1] Complete each of the following:

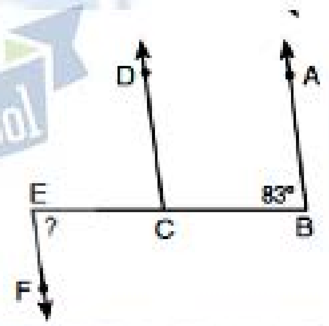
1) When a transversal cuts two parallel lines, Then :
   The alternate angles are ....,
   The corresponding angles are ....
   The interior angles on the same side of the transversal are ....

2) A straight line that is perpendicular to one of two parallel lines is also .... to the Other.
3) A straight line that is parallel to one two parallel lines is also .... to the other.
4) A straight line that is perpendicular to one of two parallel lines is ....
5) The two straight lines perpendicular to a third one are ....

[2] In the figure opposite :

$\overrightarrow{BA} \parallel \overrightarrow{CD}$, $\overrightarrow{CD} \parallel \overrightarrow{EF}$ and

m (∠ABC) = 83° find m (∠CEF).



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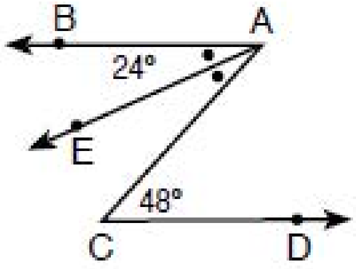
[3] In the figure opposite :

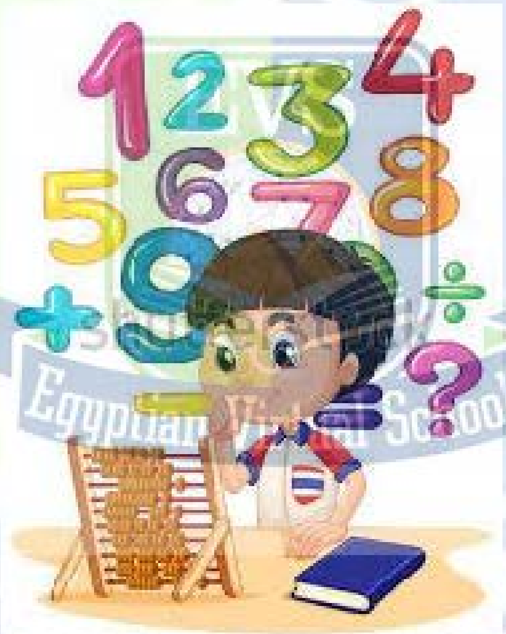
AE bisects ∠BAC , m (∠ BAE) = 24°

m (∠ ACD) = 48°. Complete :

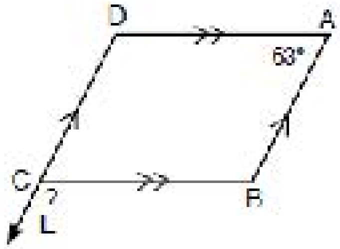
First : m (∠ BAC) = ……….. °

Second : $\overrightarrow{AB}$ // $\overrightarrow{\ldots\ldots\ldots}$





[4] In the figure opposite :



$\overrightarrow{AB} // \overrightarrow{DC}$, $\overrightarrow{AD} // \overrightarrow{BC}$ and

m (∠BAD) = 63°

find m (∠BCE).

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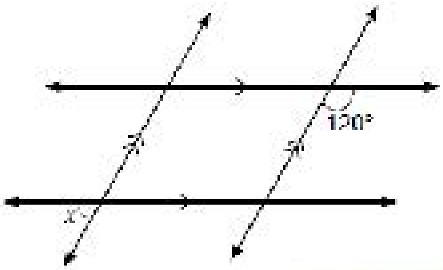
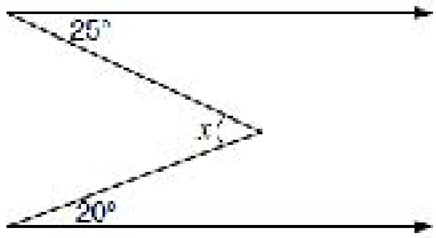
[5] Find the value of x in each figure:

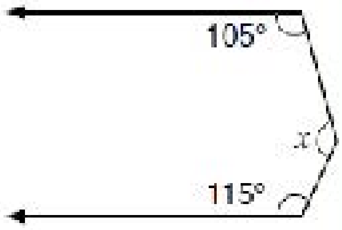
a)



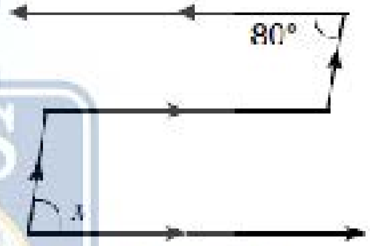
b)



c)



d)



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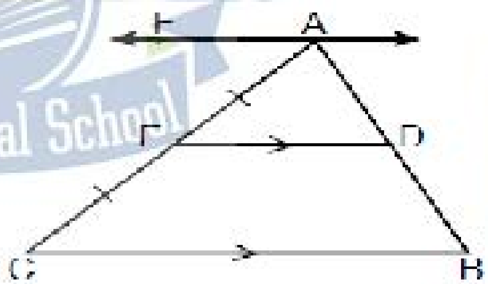
[6] In the figure opposite :

If AB = 3 cm

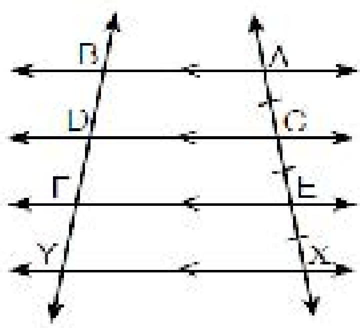
then BD = ……….. cm



[7] In the figure opposite :

If BF = 2 cm

then BY = ……….. cm



Geometric constructions

*Constructing the bisector of a given angle

[1] Draw an angle of measure 80° ,then use the compass to bisect it.

(Don't remove arcs)

[2] Draw an angle of measure 120° ,then use the compass to divide it

into four equal angles in measure . (Don't remove arcs)

[3] Using the ruler and the compass ,draw the equilateral triangle ABC of side length 6cm. Bisect each of $\angle A$,$\angle B$,$\angle C$ by bisectors Intersecting at M , What is the relation between MA, MB and MC?

Summary of geometry

for prep one (1^{st} term)

1) The sum of measures of two complementary angles equals 90

2)The sum of measures of two supplementary angles equals 180

3) The measure of the straight angle is 180

4) The measure of the right angle is 90

5) The two adjacent angles formed by a straight line and a ray with a starting point on this straight line are supplementary

6) The outer sides of the two supplementary adjacent angles are on the same straight line

7) If the two adjacent angles are not supplementary , then their outer sides are not on the same straight line

8) If the two adjacent angles are complementary , then their outer sides are perpendicular

9) The sum of measures of the accumulative angles at a point = 360

10) The two adjacent angles in which the two outer sides are on the same straight line are supplementary

11) If two straight line intersect, then each two vertically opposite angles are equal in measure

12) In the right angled triangle, the area of the square drawn on its hypotenuse is equal to the sum of the areas of the squares drawn on the other two sides

13) The acute angle is supplemented by an obtuse angle

14) The right angle is supplemented by a right angle

15) If two angles are supplementary , then one of them is an acute and the the other is an obtuse or both of them are right angles .

16) Two triangles are congruent :

1- if two sides and the included angle of the first triangle are congruent to their corresponding from the other triangle

2- if two angles and the included side of the first triangle are congruent to their corresponding from the other triangle

3- If each side of the first triangle is congruent to its corresponding from the other triangle

4- The two right angled triangle are congruent if the hypotenuse and a side of one triangle are congruent to their corresponding from the other triangle

17) If a straight line intersects two parallel straight lines then each two alternate angles are equal in measure

18) If a straight line intersects two parallel straight lines then each two corresponding angles angles are equal in measure

19) If a straight line intersects two parallel straight lines then each two interior angles at one side of the transversal are supplementary

20) If a straight line intersect two straight lines and two alternate angles are equal in measure, then the two lines are parallel

21) If a straight line intersect two straight lines and two corresponding angles are equal in measure, then the two lines are parallel

22)If a straight line intersect two straight lines and two interior angles at one side of the transversal are supplementary , then the two lines are parallel

23)If two straight lines are parallel to a third straight line , then the two straight lines are parallel

24)The two perpendicular straight lines to a third line are parallel

25)The perpendicular straight line to one of two parallel straight line is perpendicular to the other

26)If parallel straight lines divide a straight line into segments of equal lengths, then they divide any other straight line into segments of equal lengths.

27)The supplements of one angle are equal in measures

28)The complements of one angle are equal in measures

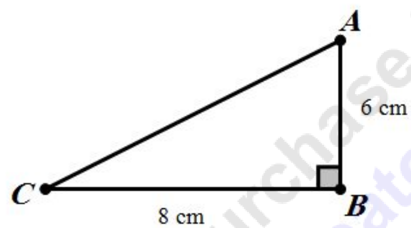
29)The acute angle complements an acute angle

30) If the triangle ABC is right-angled triangl at B, then

$(AC)^2 = (AB)^2 + (BC)^2$

$(AB)^2 = (AC)^2 - (BC)^2$

$(BC)^2 = (AC)^2 - (AB)^2$



Best wishes

Mr/ Gamal Serag

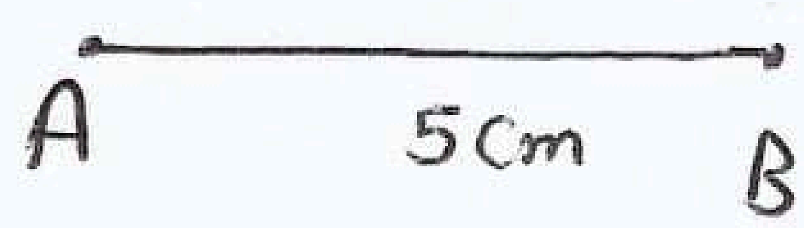
Geometry

Unit 4 : Geometry and measurement

① Geometric concepts and the relations between angles.
② Congruence.
③ Parallelis.
④ Geometric constructions.

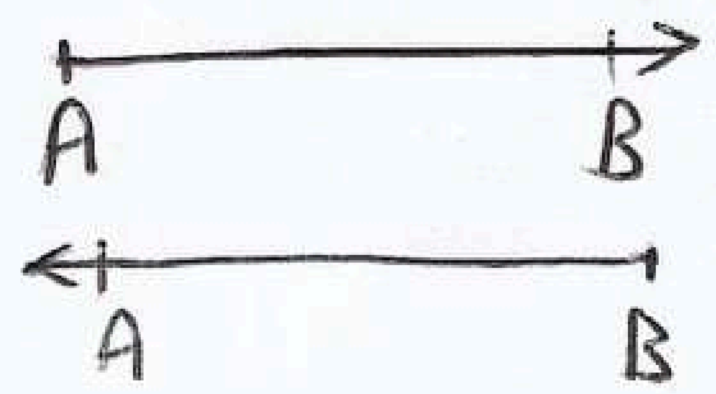
I Geometric concepts and the relations between the angles.

* **The line segment** is aset of points consisting of two distinct points and all Points between them when we join them by a ruler, it has two end points $\overline{AB}$ or $\overline{BA}$ and its length is 5 cm (AB = 5 cm)



* **The ray** is aline segment extended from only on of its terminals without limit, it has astarting point and it hasn't end point

$\overrightarrow{AB} \neq \overrightarrow{BA}$ and it has no Length $\overline{AB} \subset \overrightarrow{AB}$

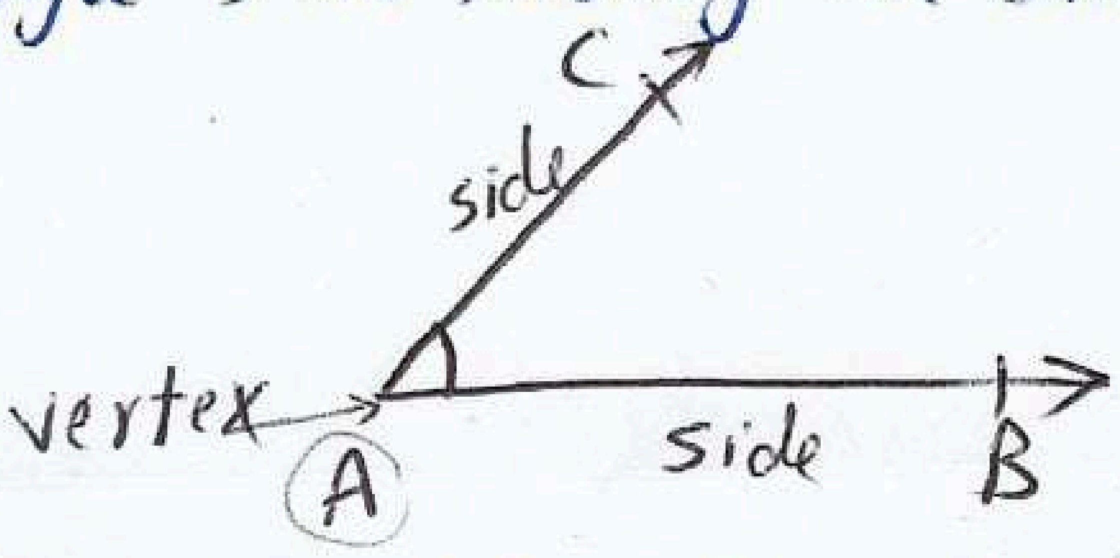


* **The straight line** is aline segment extended from both direction infinitely, it hasn't astarting and hasn't ending point

$\overleftrightarrow{AB}$ or $\overleftrightarrow{BA}$ it has no length. $\overline{AB} \subset \overrightarrow{AB} \subset \overleftrightarrow{AB}$

* **The angle** is the union of two rays with the same starting point and this point is called the vertex of the angle, the two ray are called Two sides of the angle

$\angle A$ or $\angle BAC$ or $\angle CAB$



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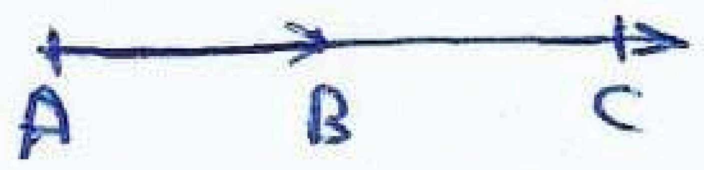
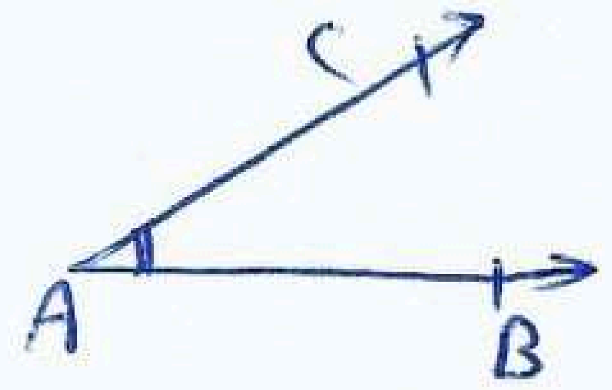
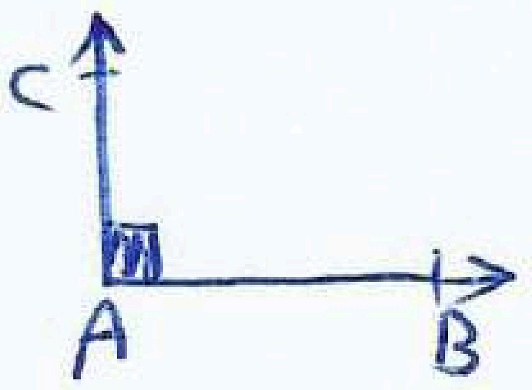
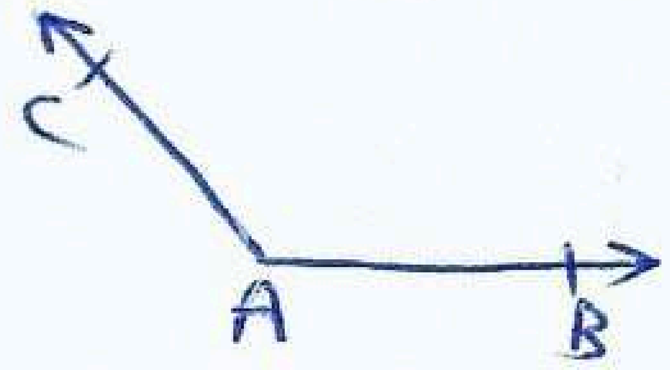
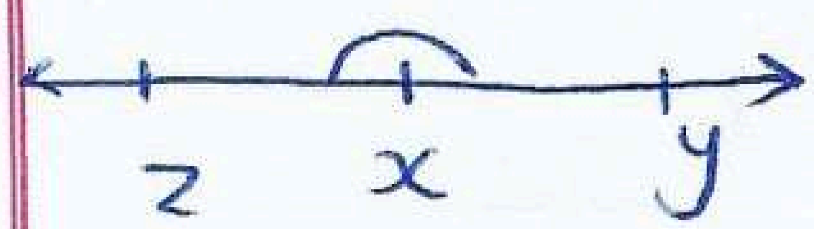
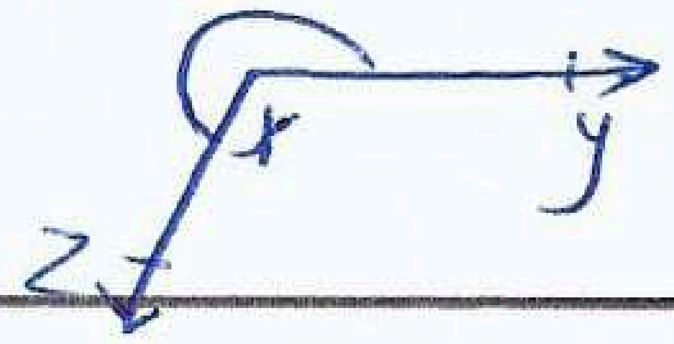
The types of angles	its measure	
① Zero angle	its measure = $0°$ its sides are coincident	
② Acute angle	$0° <$ its measre $< 90°$ for example $32° 30'$, $60°$	
③ Right angle	its measure = 90 or $89° 60'$ ($60' = 1°$)	
④ obtuse angle	$90° <$ its measure $< 180°$ for example $100°$, $179° 30'$	
⑤ straight angle	its measure = $180°$ its sides are forming one straight line	
⑥ Reflex angle	$180° <$ its measure < 360 for example $200°$, $350°$	

$m(\angle yxz) + m(\text{reflex} \angle yxz) = 360°$

The relations between the angles.

① Adjacent angles

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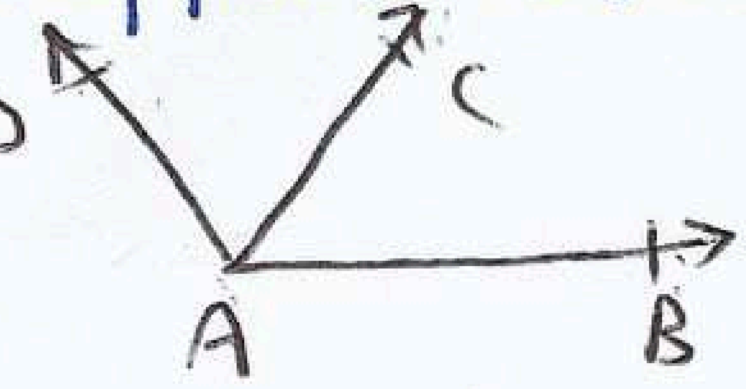
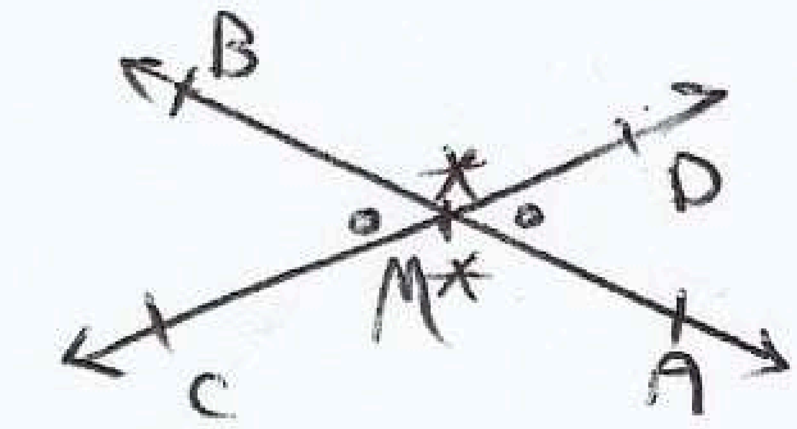
Two angles are said to be adjacent if they have a common vertex and a common side and the other two side are on opposite sides of this common side $\angle CAB$ and $\angle CAD$ adjacent



② vertically opposite angles (V.O.A)

If two straight lines intersect, then the measures of each two vertically opposite angles are equal.

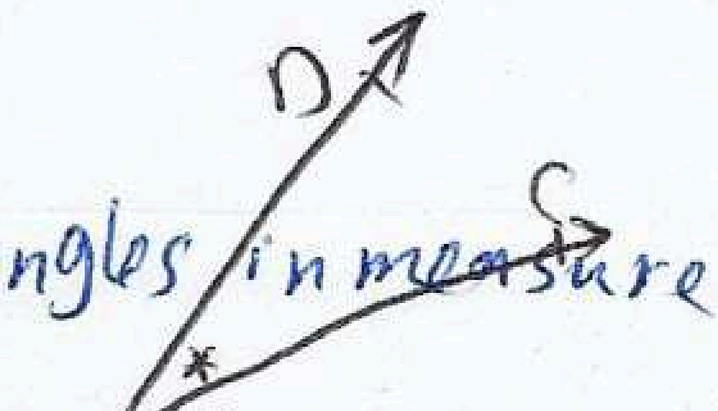
$m(\angle DMA) = m(\angle BMC)$, $m(\angle DMB) = m(\angle AMC)$



③ The angle bisector.

it is the ray that divides the angle into two equal angles in measure

$m(\angle CAB) = m(\angle CAD) = \frac{1}{2} m(\angle BAD)$

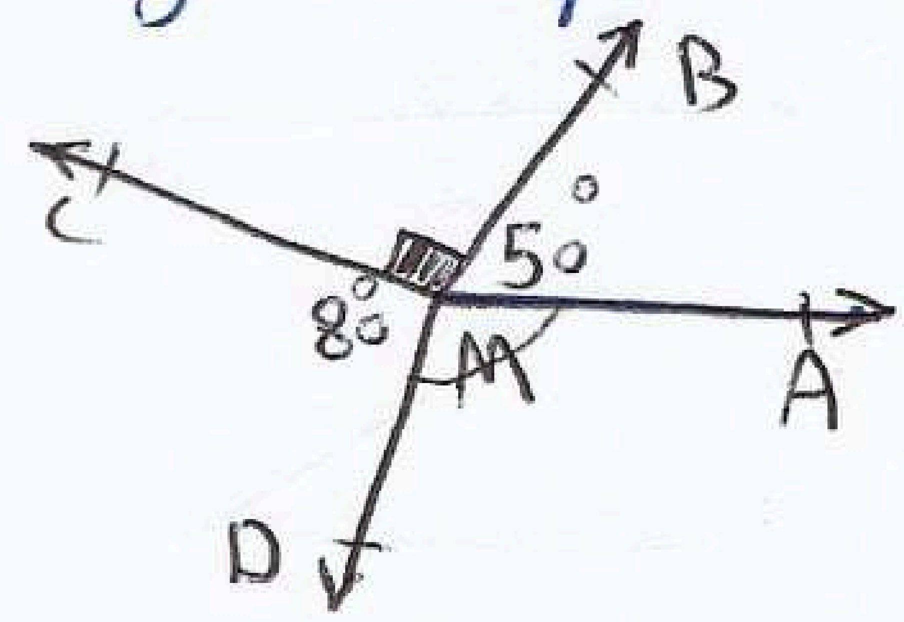


④ Accumulative angles at a point

The sum of the measures of the accumulative angles at a point is 360°

$m(\angle AMB)+m(\angle BMC)+m(\angle CMD)+m(\angle DMA)=360^\circ$

then $m(\angle DMA)=360^\circ-(50^\circ+90^\circ+80^\circ)=140^\circ$



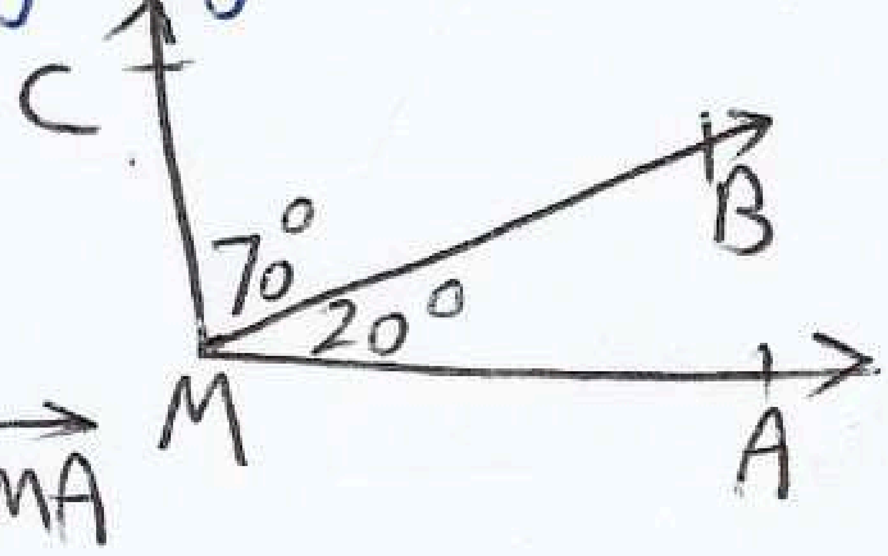
⑤ complementary angles.

two angles are said to be complementry if the sum of their measures is 90°

* two angles are either acute angles or one is zero angle and the other is a right angle.
* the complements of the same angle are equal in measure

If $\angle A$ complements $\angle B$, $\angle C$ complement $\angle B$ then $m(\angle A)=m(\angle B)$

* If the two adjacent angle are complementary angle , then their outer sides are perpendicular.



$m(\angle AMB)+m(\angle BMC)=90^\circ$ then $\overrightarrow{MC} \perp \overrightarrow{MA}$

⑥ supplementray angles.

two angles are said to be supplementray if the sum of their measures is 180°

* two angles (obtuse and acute) or (right and right) or (zero and straight angle)
* the supplementray of the same angle are equal in measure

If $\angle A$ supplementray $\angle B$ and $\angle C$ supplements $\angle B$ then $m(\angle A)=m(\angle B)$

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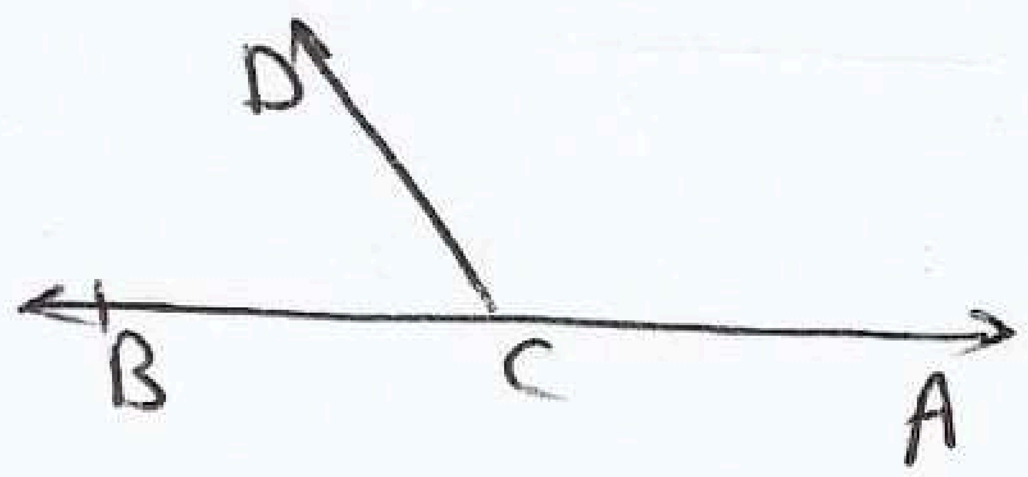
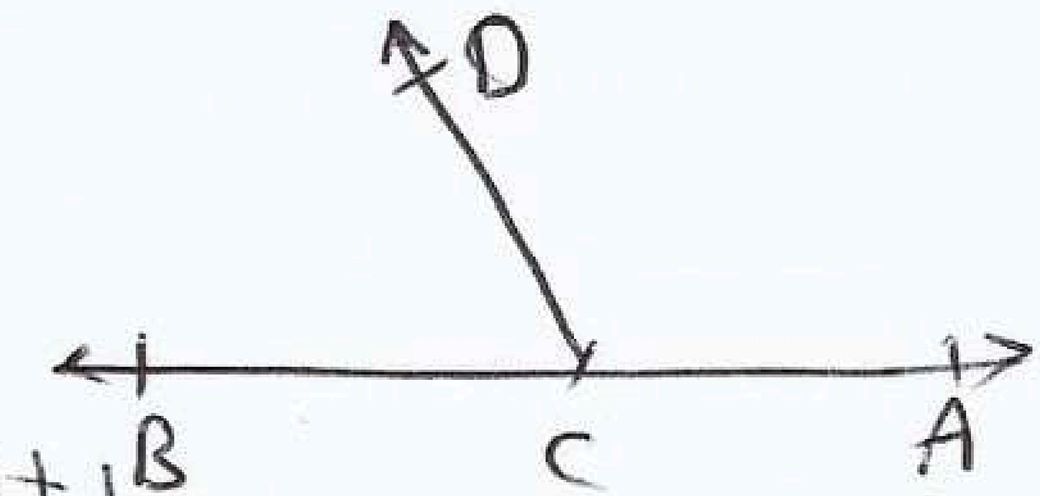
* two adjacent angles formed by astraight line and aray with astarting. Point on this straight line are supplementary.

If $\overleftrightarrow{AB} \cap \overrightarrow{CD} = \{C\}$

Then $m(\angle ACD) + m(\angle DCB) = 180^\circ$



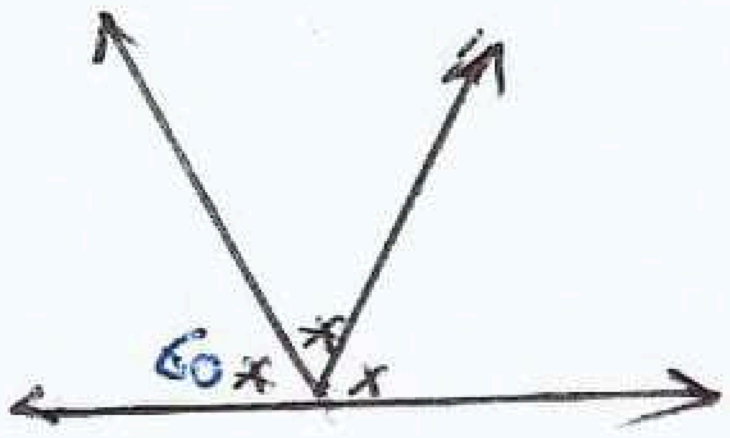
* If two adjacent angles are supplementray, then their outer sides are on the same straight line



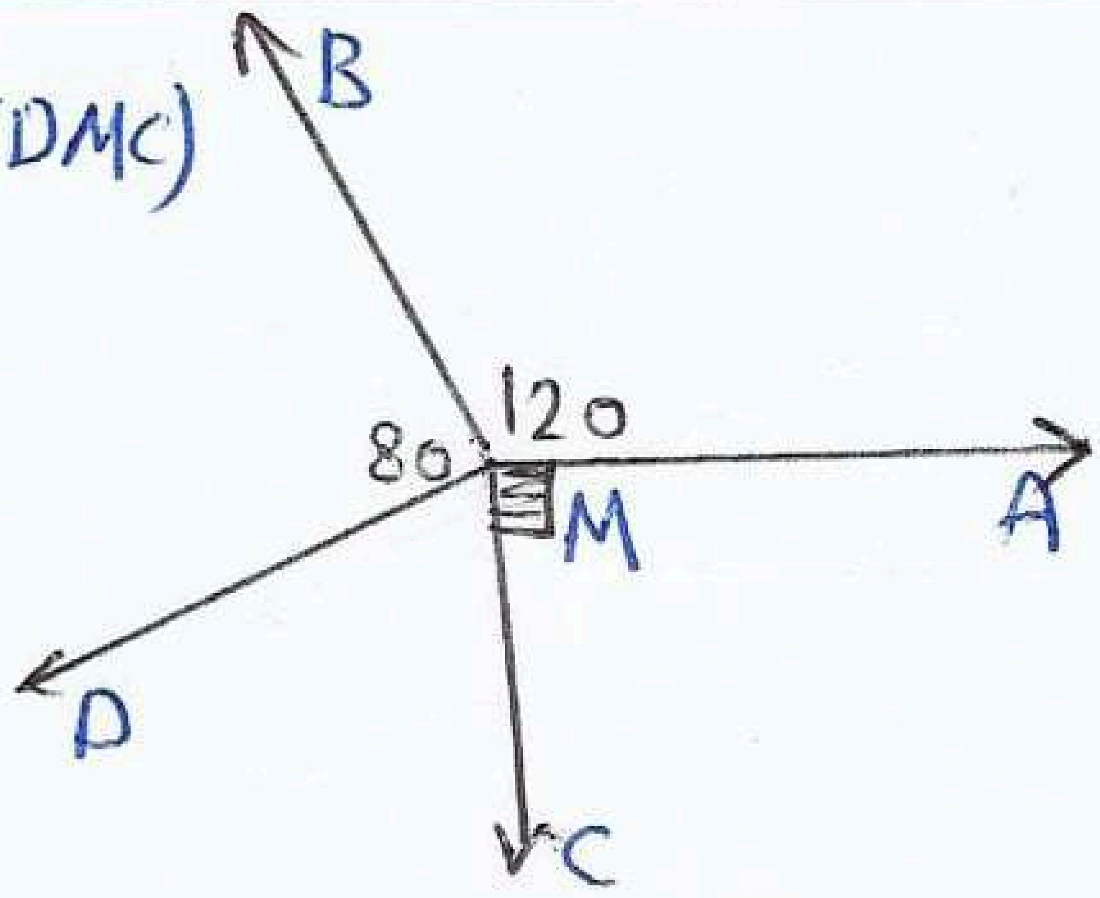
If $m(\angle ACD) + m(\angle DCB) = 180^\circ$

Then $\overrightarrow{CA}$ and $\overrightarrow{CB}$ are on the same straight line or $\angle ACB$ is astraight angle. try by your self.

① Are $\overrightarrow{CA}$ and $\overrightarrow{CB}$ on same straight line? why?



② Find $m(\angle DMC)$



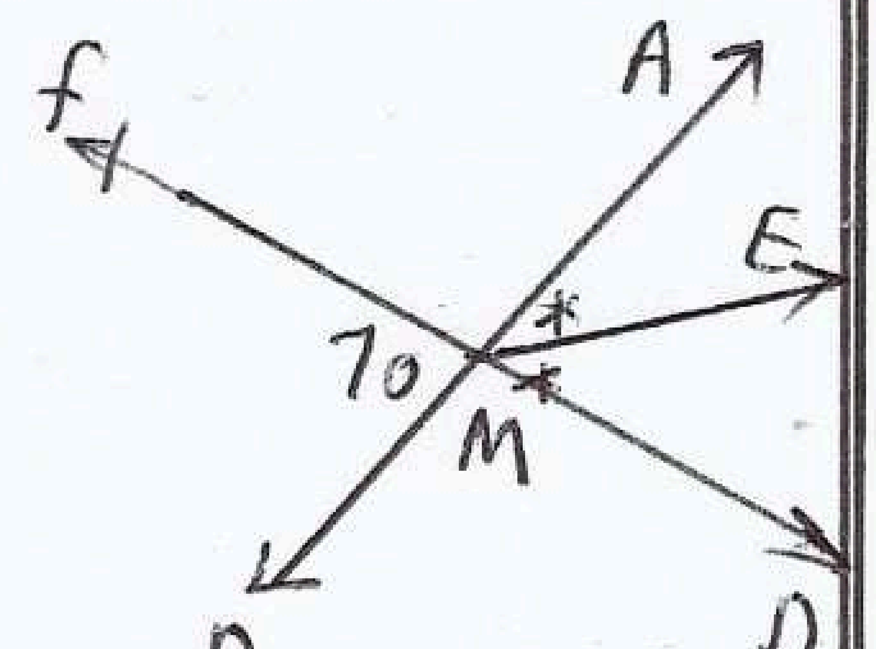
③ the value of $x = \_\_\_^\circ$

④ $\overleftrightarrow{AB} \cap \overleftrightarrow{DF} = \{M\}$

find $m(\angle AMF)$

$m(\angle AMD)$

$m(\angle DME)$



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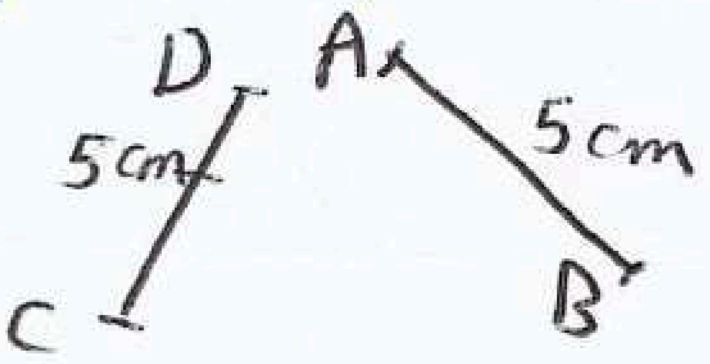
2] Congruence

① Congruence of two line segments

Two line segments are congruent if they are equal in length

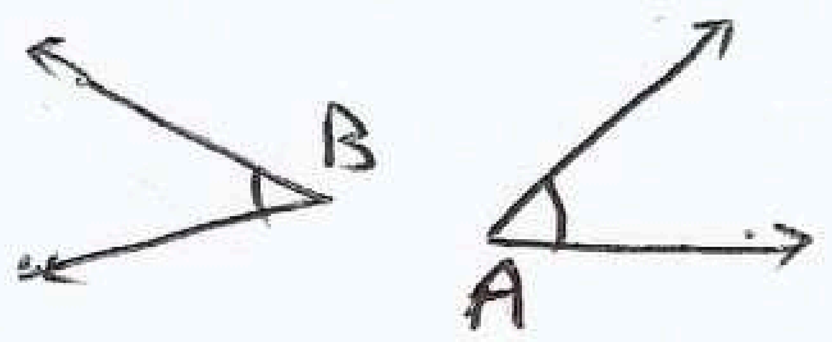
If $AB = CD$ then $\boxed{\overline{AB} \equiv \overline{CD}}$



② Congruence of two angles

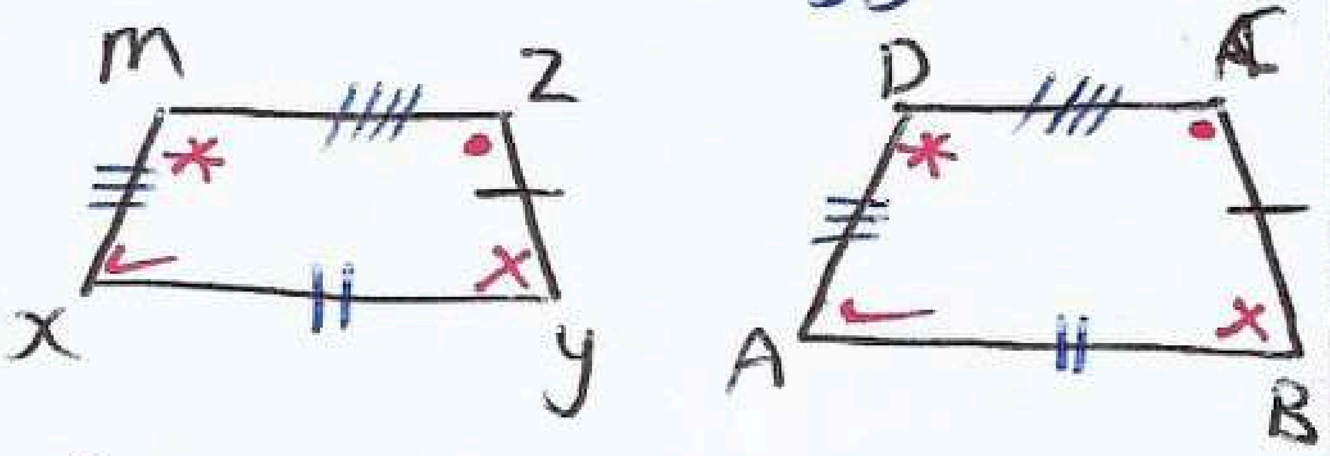
Two angles are congruent if they are equal in measure

$\because m(\angle A) = m(\angle B) = 50^\circ$ then $\boxed{\angle A \equiv \angle B}$



③ Congruence of two polygons

two polygons are congruent if there is correspondence between their vertices ~~sh~~ such that each side and each angle in the first polygon is congruent to its corresponding element in the other polygon.



If $m(\angle A) = m(\angle x)$, $m(\angle B) = m(\angle y)$

$m(\angle C) = m(\angle Z)$, $m(\angle D) = m(\angle m)$

and $AB = xy$, $BC = yZ$, $CD = Zm$, $DA = mx$

then the polygon $ABCD \equiv$ the polygon $xyZm$

notes:

* The two square are congruent if their side are equal in length
* The two rectangle are congruent if their dimension are equal.
* The axis of symmetry of apolygon divides it into two congruent polygons
* The diagonal of the rectangle divides its surface into two congruent traingle

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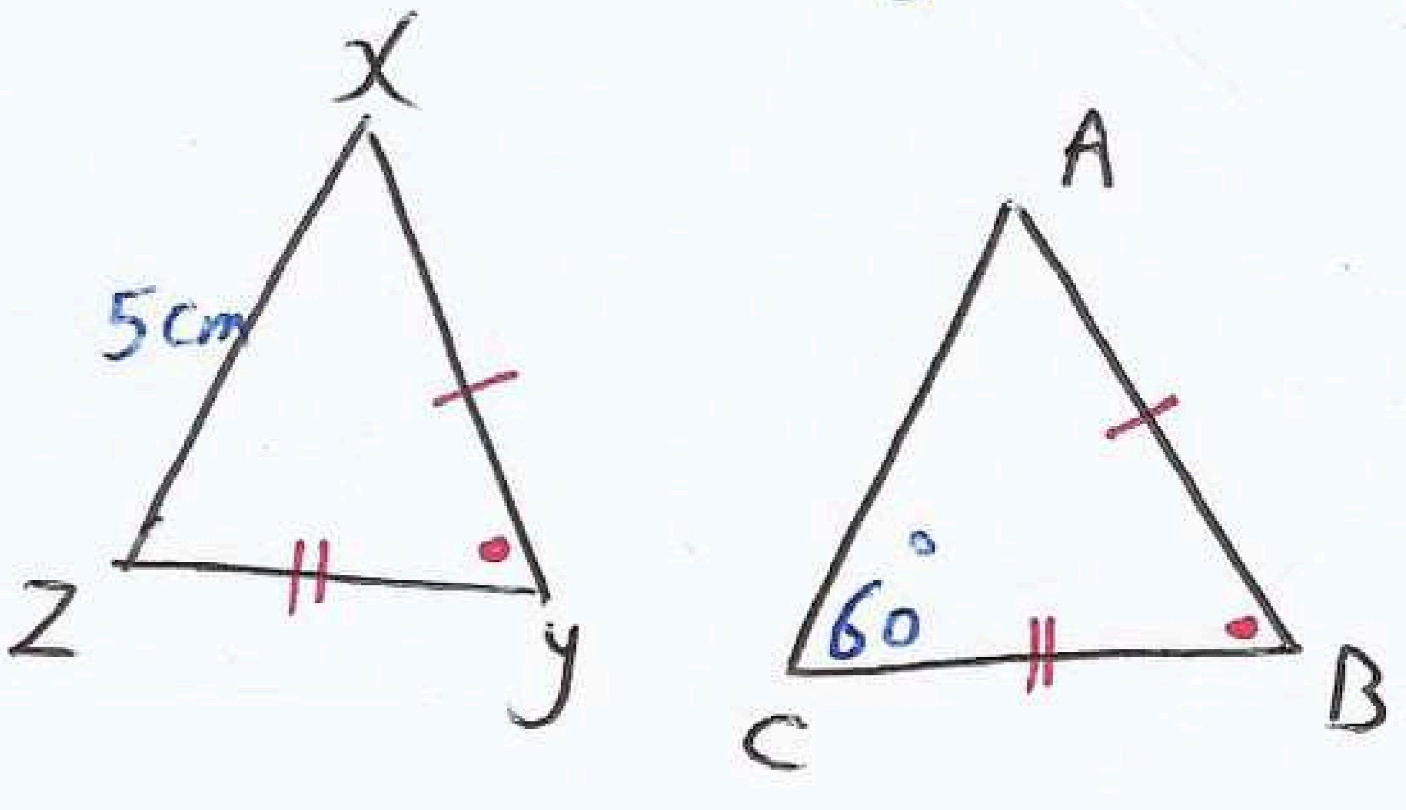
④ Congruent triangles

The first case (S.A.S)

Two triangles are congreuent if two sides and the included angle of one triangle are congruent to the corresponding parts of the other triangle.



In $\Delta\Delta$ ABC , xyZ

① $AB = xy$ S

② $m(\angle B) = m(\angle y)$ A

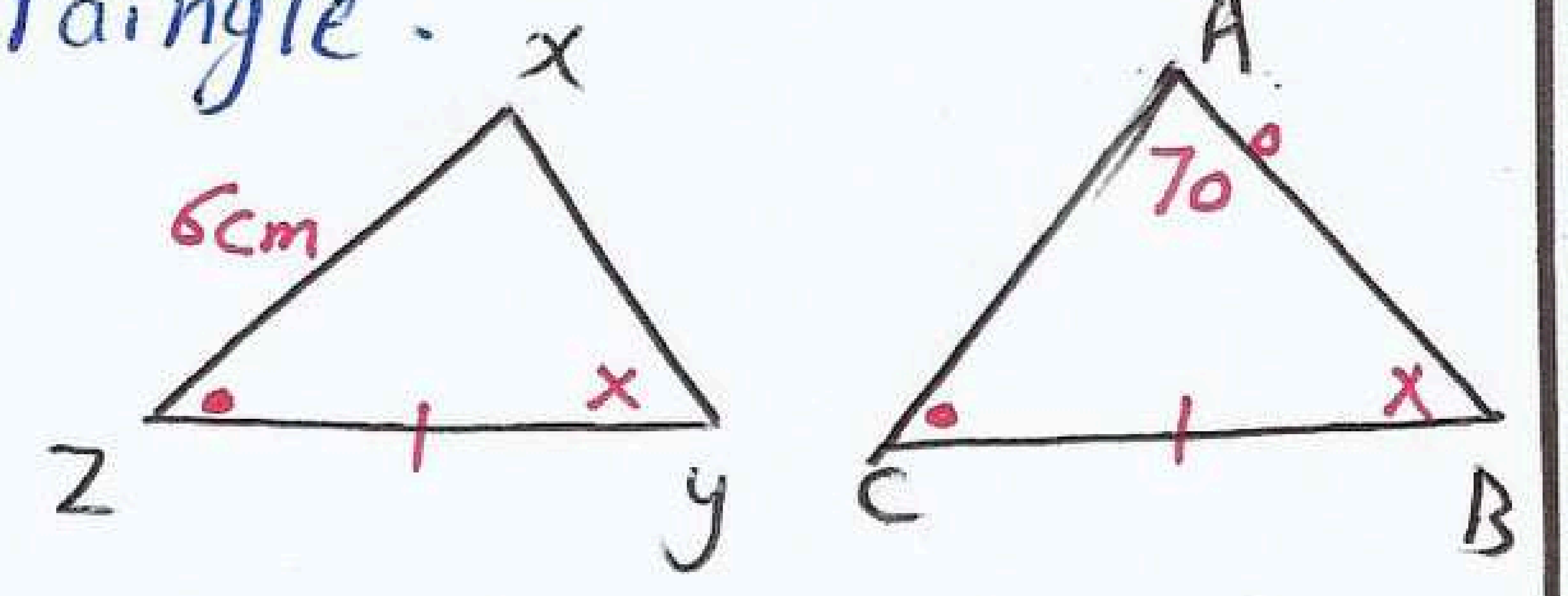
③ $BC = yZ$ S

then $\Delta ABC \equiv \Delta xyZ$, and we deduce that

① $AC = xZ = 5\text{ cm}$, ② $m(\angle C) = m(\angle Z) = 60°$, ③ $m(\angle A) = m(\angle x)$

The second case (A·S·A)

Two triangle are congruent if two angles and the side draw between their vertices of one triangle are congruent to the corresponding parts of the other traingle.



In $\Delta\Delta$ ABC , xyZ

① $m(\angle B) = m(\angle y)$ A

② $BC = yZ$ S

③ $m(\angle C) = m(\angle Z)$ A

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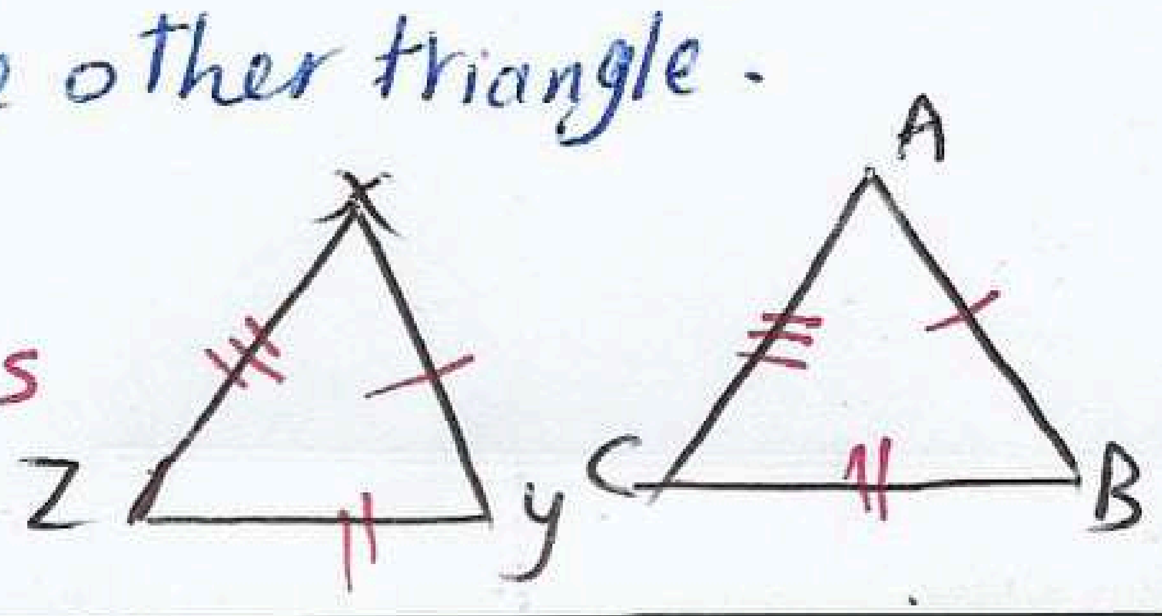
Then $\Delta ABC \equiv \Delta xyZ$ and we deduce that

① $m(\angle A) = m(\angle x) = 70°$, ② $CA = Zx = 6\text{ cm}$, ③ $AB = xy$

The third case (S.S.S)

Two triangle are congruent if each side of one triangle is congruent to the corresponding side of the other triangle.



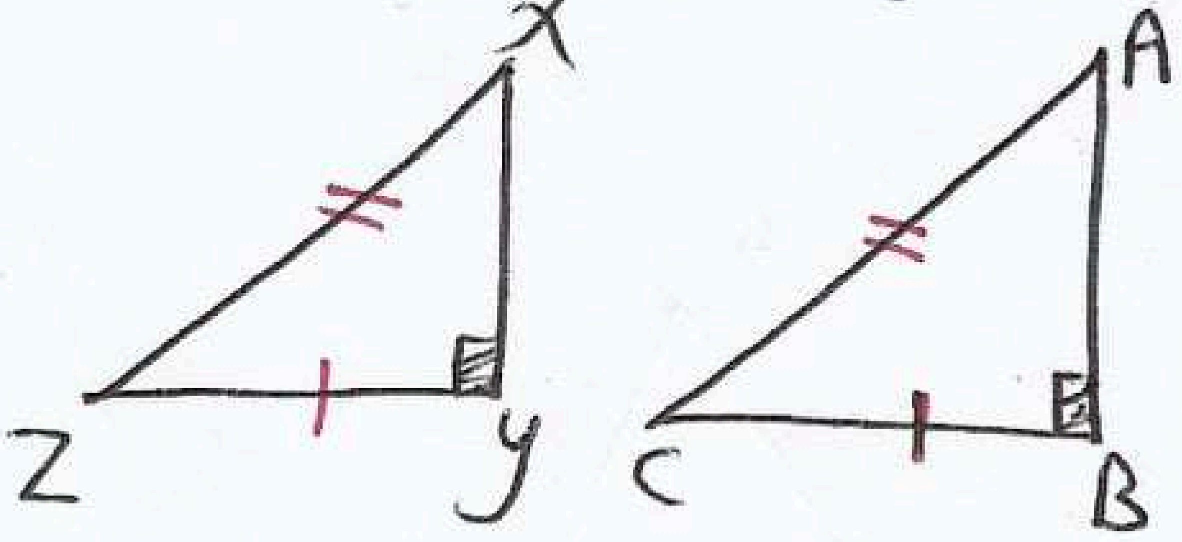
In $\Delta\Delta$ ABC , xyZ

① $AB = xy$ S ② $BC = yZ$ S ③ $AC = xZ$ S

Then $\Delta ABC \equiv \Delta xyZ$

The fourth Case (R·H·S)

Two right-angled triangle are congruent if the hypotenuse and aside of one triangle are congruent to the corresponding parts of the other triangle.



In $\triangle\triangle ABC$, xyz

$$\begin{cases} ① \ m(\angle B) = m(\angle y) = 90^\circ \\ ② \ AC = XZ \\ ③ \ BC = yZ \end{cases}$$

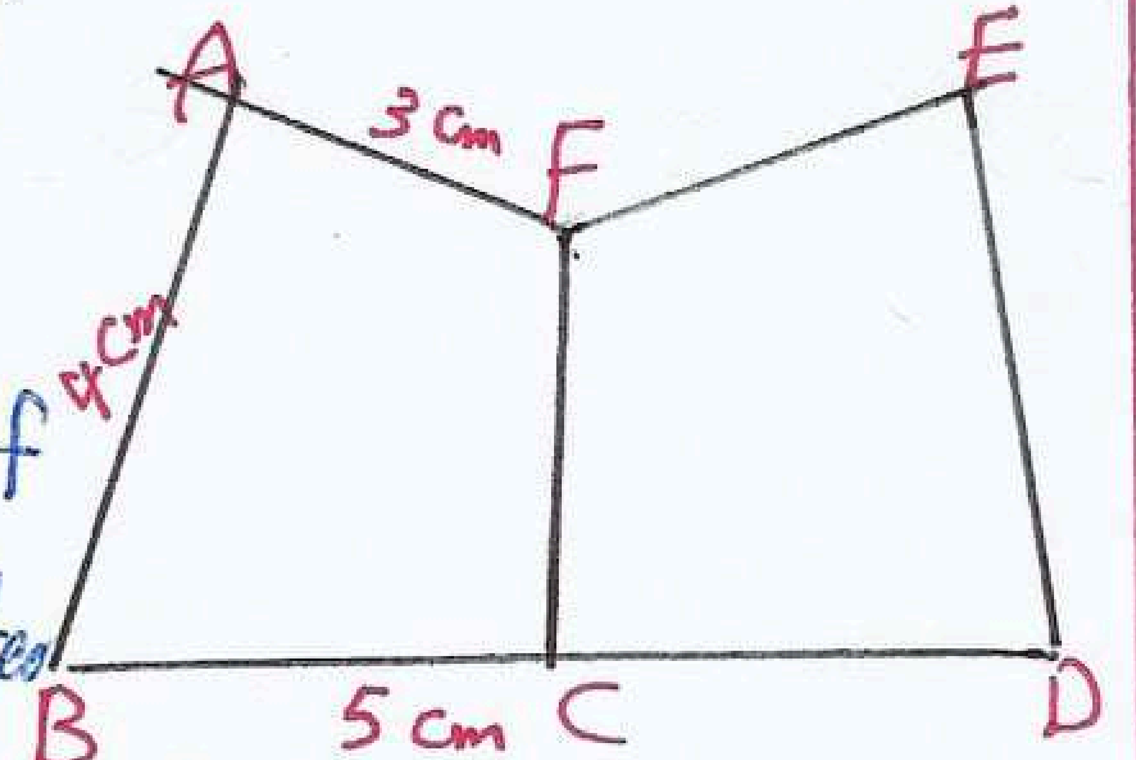
Right angle
hypotenuse
side

Then $\triangle ABC \equiv \triangle xyz$

try by yourself.

① If $C \in \overline{BD}$ and Bigon $ABCf \equiv EDCf$

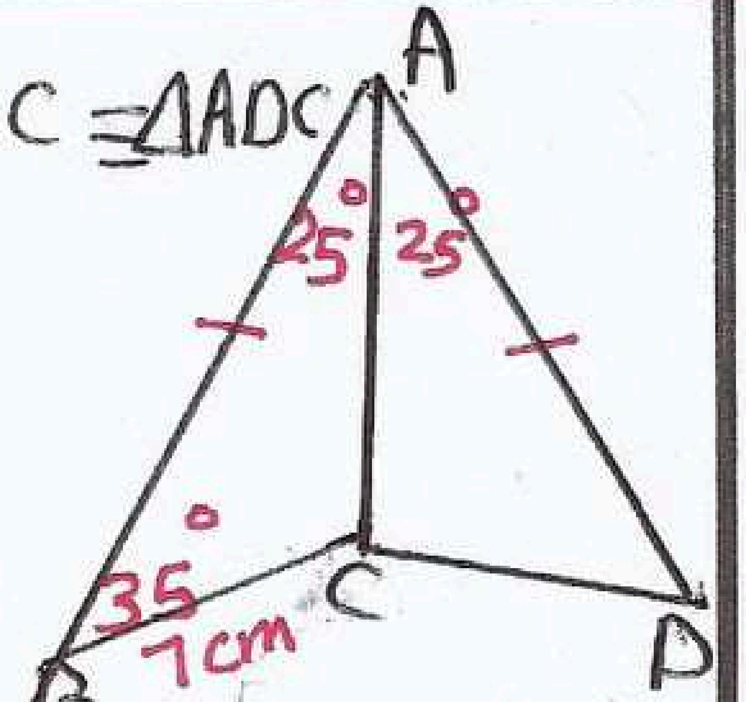
Find the perimeter of Figure $ABDEf$



② prove that $\triangle ABC \equiv \triangle ADC$

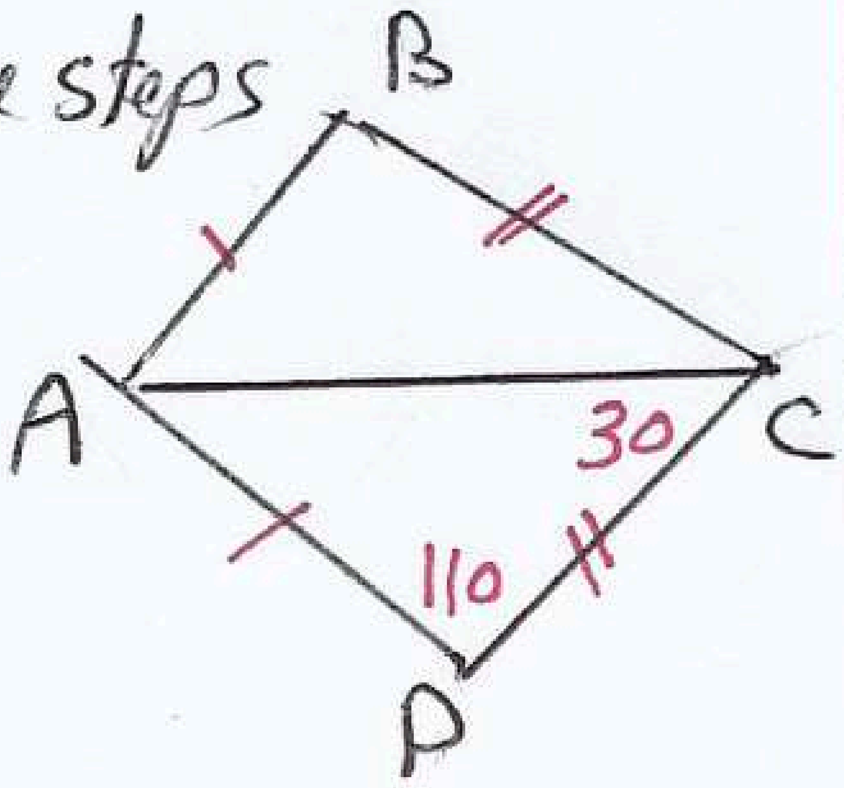
find $m(\angle D)$

length of $\overline{CD}$



③ Find showing the steps

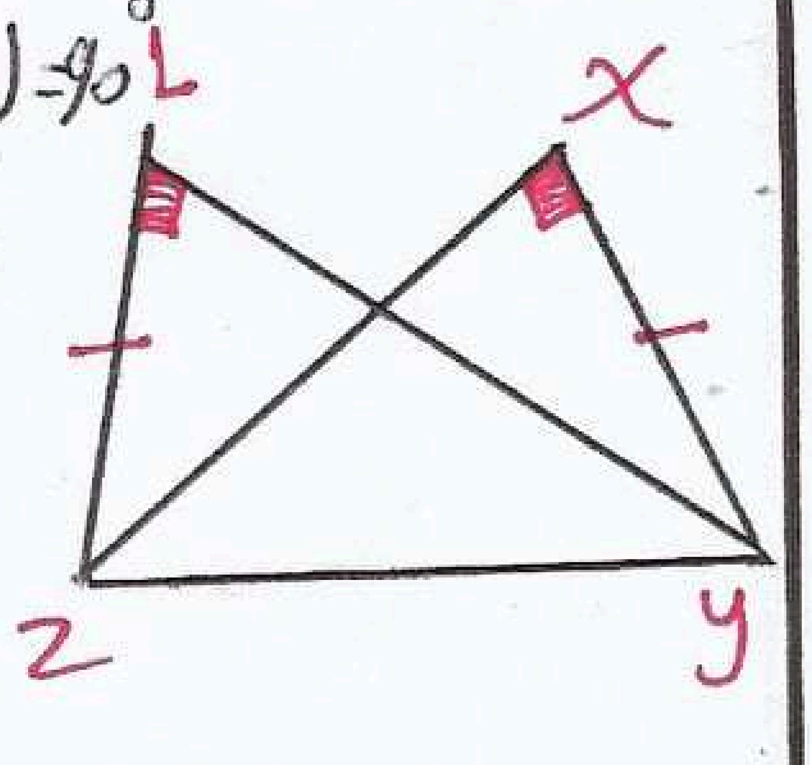
$m(\angle ABC)$



④ $m(\angle x) = m(\angle l) = 90^\circ$

Is $\triangle xyz \equiv \triangle lzy$

why ?



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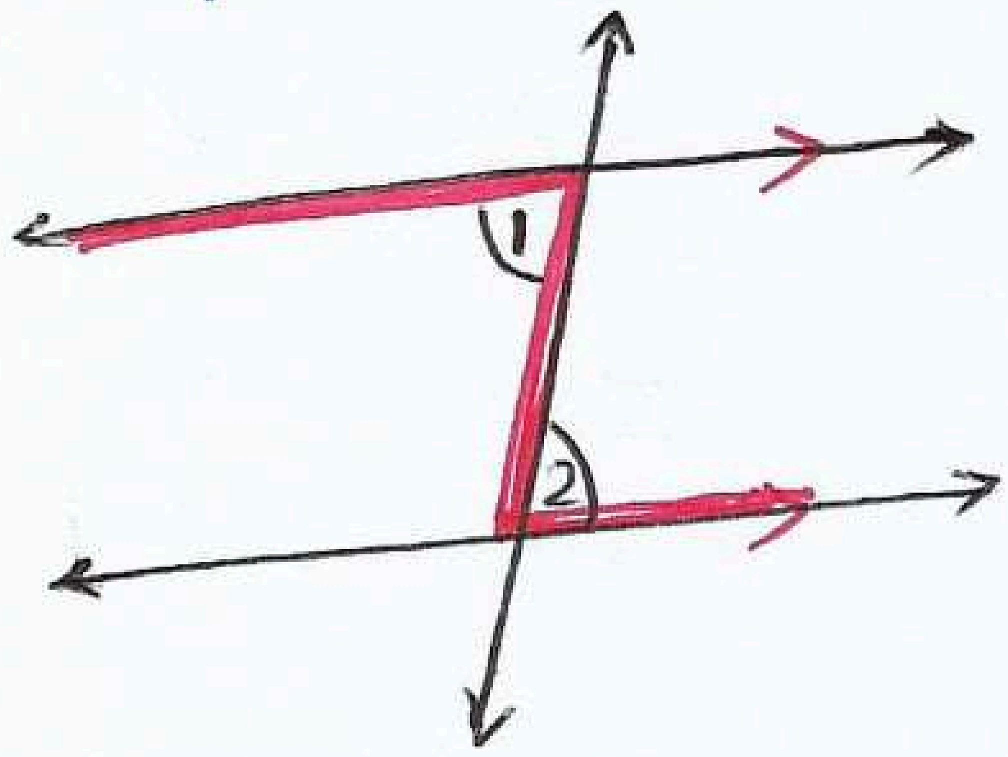
3 Parallelism

If a straight line intersects two parallel straight lines, then

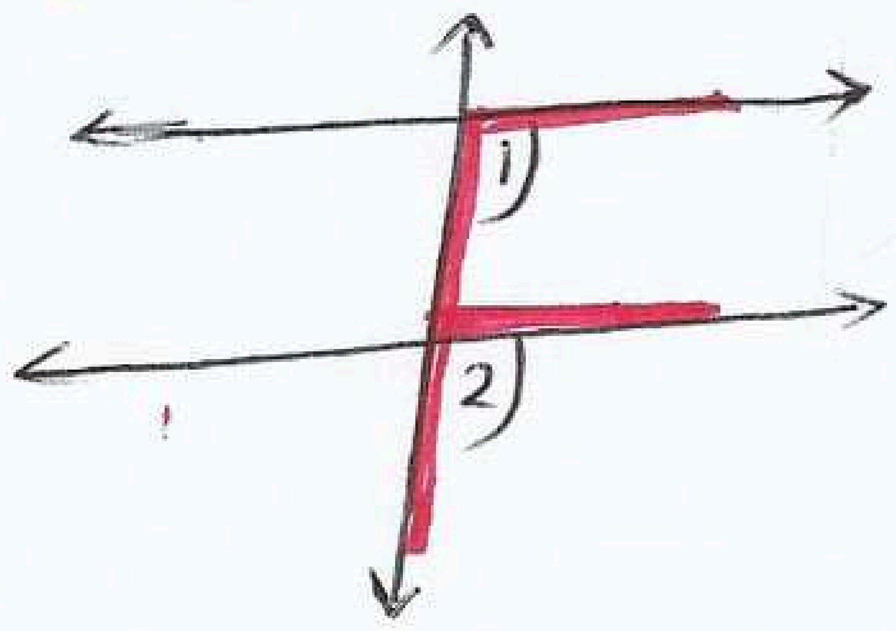
Each two alternate angles are equal in measure. Z



$m(\angle 1) = m(\angle 2)$

alternate angles

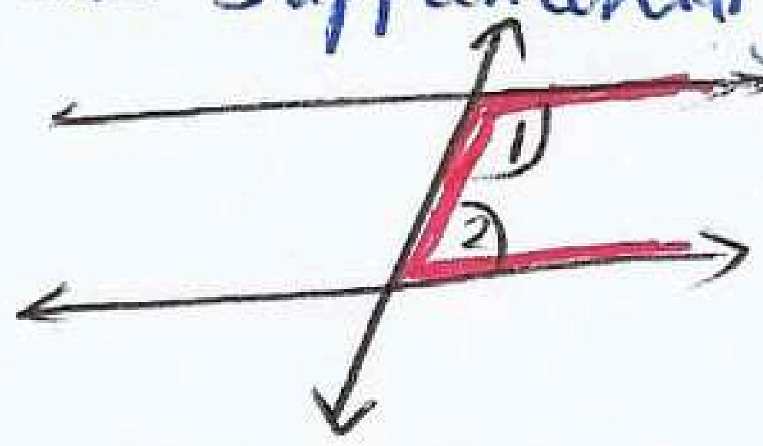
Each two corresponding angles are equal in measure F



$m(\angle 1) = m(\angle 2)$

corresponding angles

Each two interior angles in the same side of the transversal U are supplementary.



$m(\angle 1) + m(\angle 2) = 180$

interior angles

How to prove the parallelism

two straight lines are parallel if a third straight line intersects them and one of the following cases is satisfied

① Two alternate angles have the same measure. or

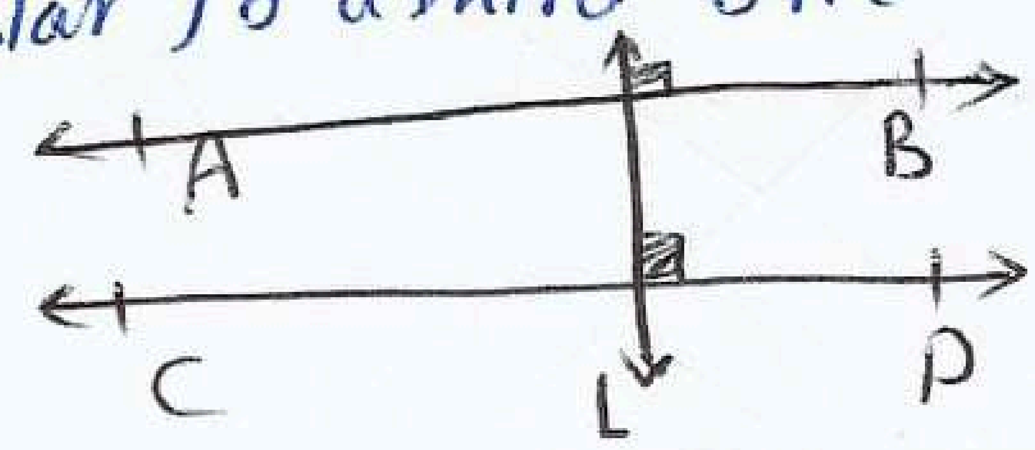
② Two corresponding angles have the same measure. or

③ Two interior angles in the same side of the transversal are supplementary.

Geometric facts.

- The perpendicular to one of two coplaner parallel straight lines is perpendicular to the other. and vice versa

if two coplaner straight lines are perpendicular to a third one then the two straight lines are parallel.



If $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$ and $\overleftrightarrow{L} \perp \overleftrightarrow{AB}$

Then $\overleftrightarrow{L} \perp \overleftrightarrow{CD}$ and vice versa

If $\overleftrightarrow{AB} \perp \overleftrightarrow{L}$ and $\overleftrightarrow{CD} \perp \overleftrightarrow{L}$

Then $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$

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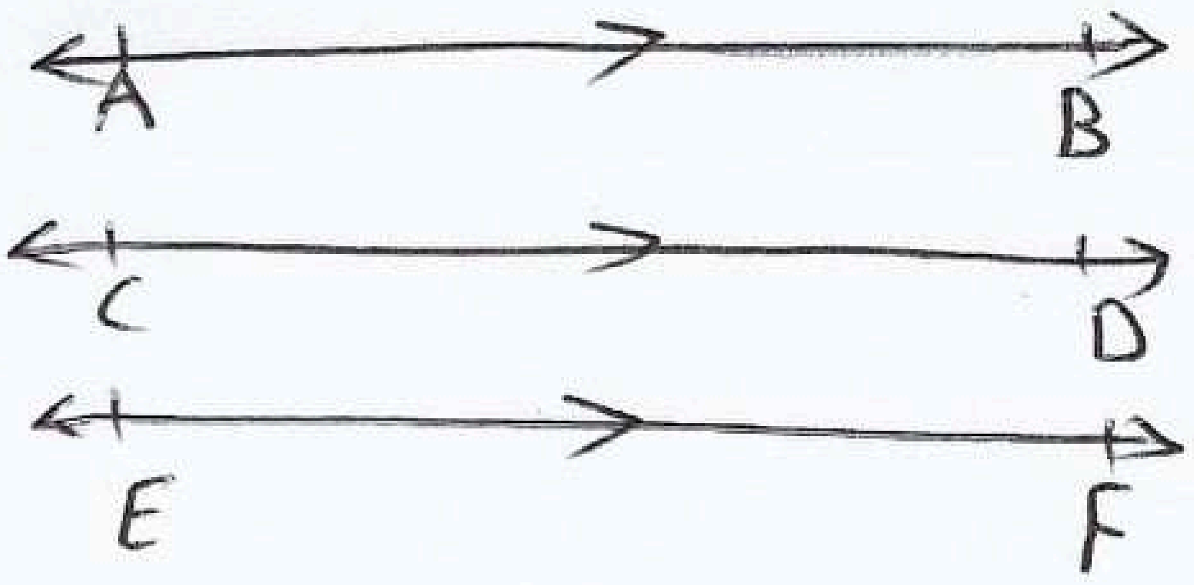
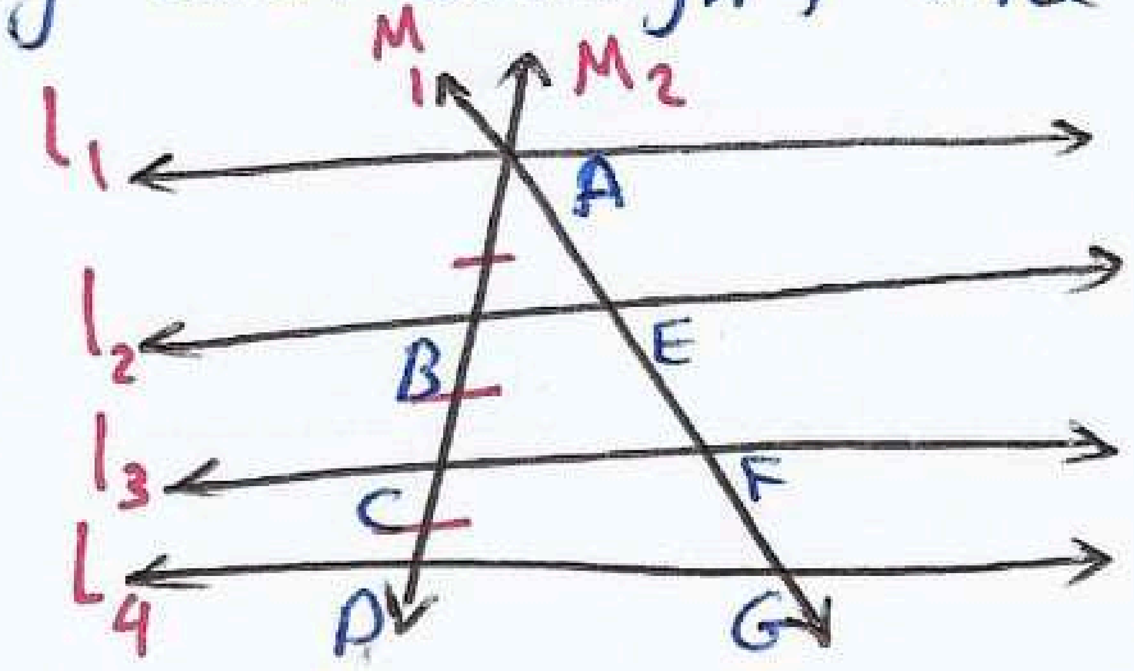
2 If two straight lines are parallel to a third, then these two straight line are parallel



If $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$ and $\overleftrightarrow{Ef} \parallel \overleftrightarrow{CD}$

Then $\overleftrightarrow{AB} \parallel \overleftrightarrow{Ef}$

3 If parallel straight lines divide a straight line into segments of equal lengths, then they divide any other straight line into segments of equal lengths.



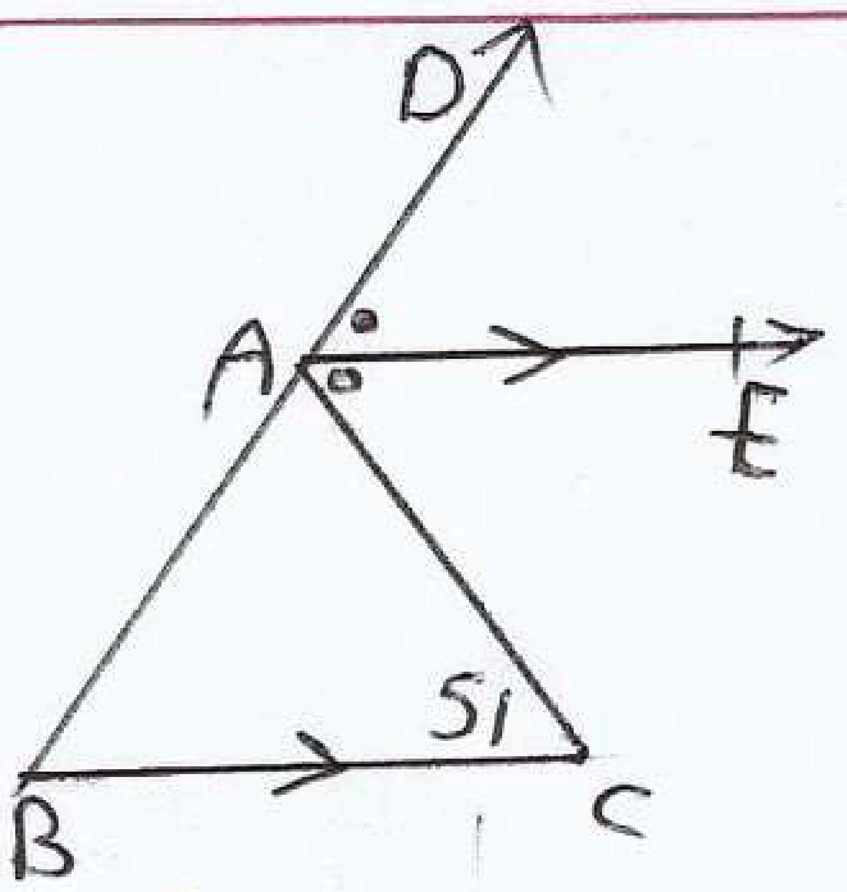
If $\overleftrightarrow{l_1} \parallel \overleftrightarrow{l_2} \parallel \overleftrightarrow{l_3} \parallel \overleftrightarrow{l_4}$ and $AB = BC = CD$

Then $AE = Ef = fG$

Try by yourself

① Find $m(\angle CAE)$

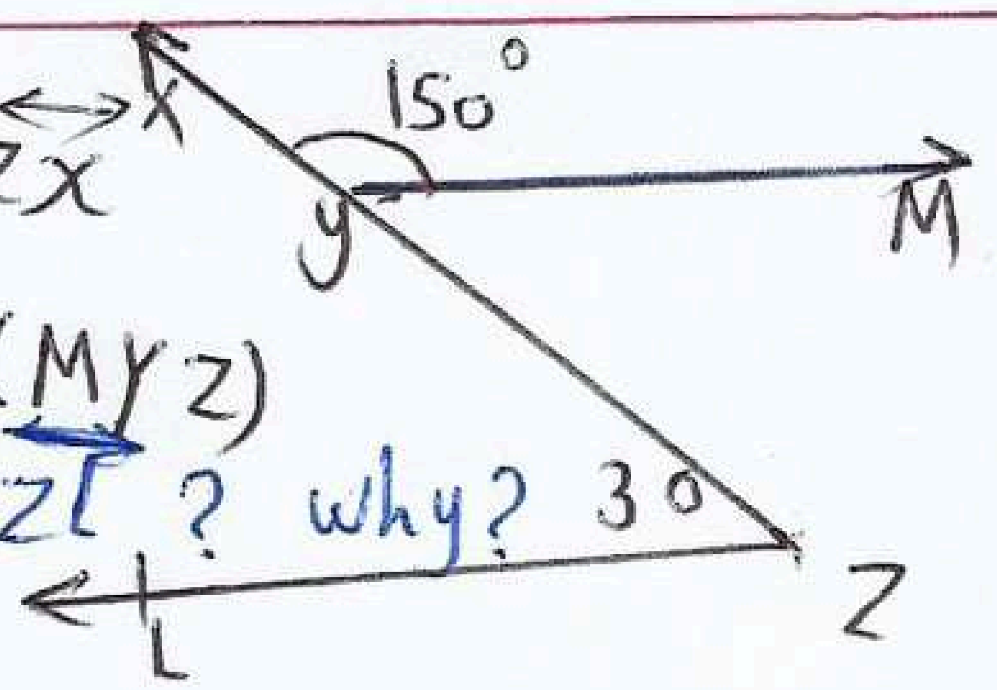
$m(\angle B)$



② $y \in \overleftrightarrow{ZX}$

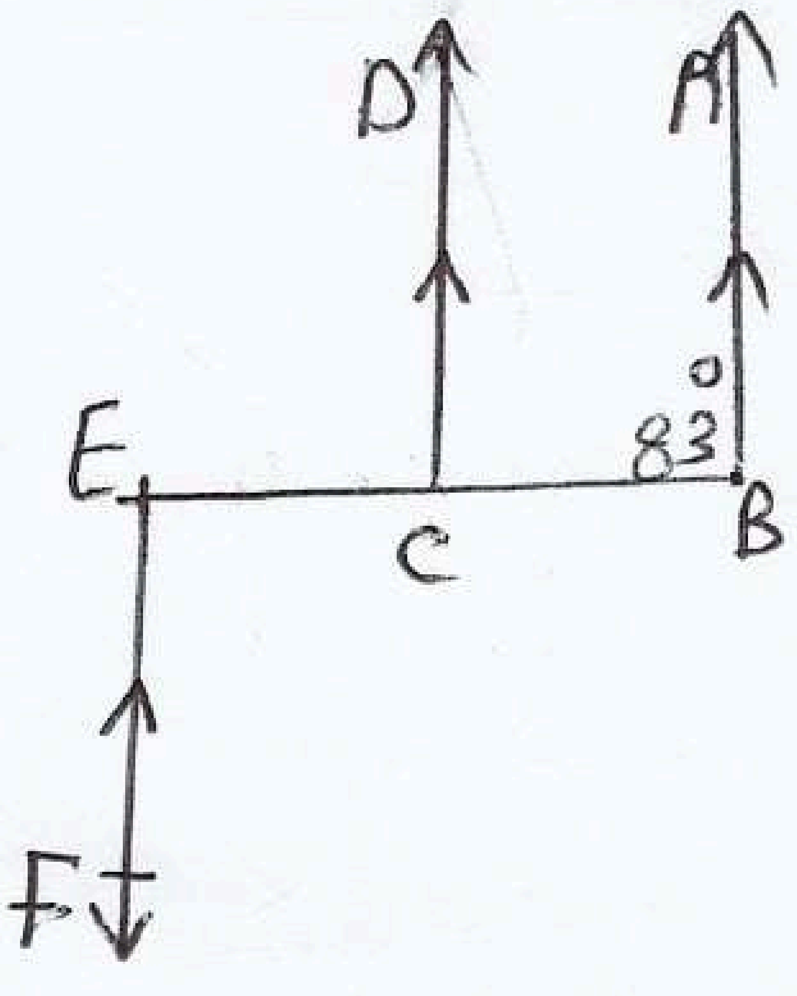
Find $m(\angle MYZ)$

Is $\overrightarrow{YM} \parallel \overrightarrow{ZL}$? why?



③ Find $m(\angle CEf)$

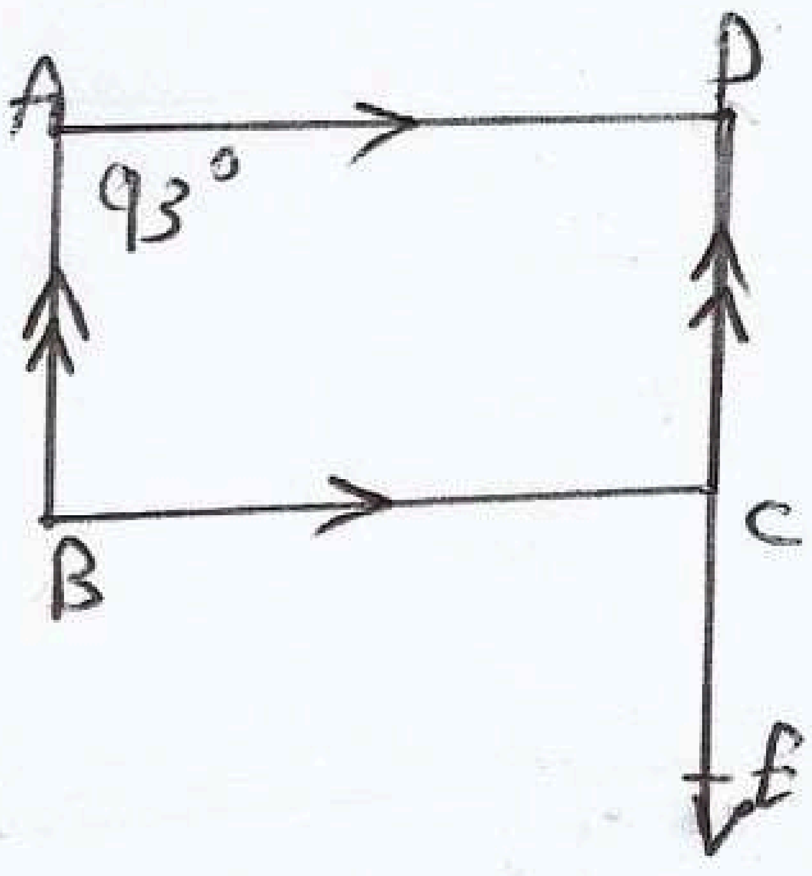
$m(\angle DCE)$



④ Find

$m(\angle BCE)$

$m(\angle D)$



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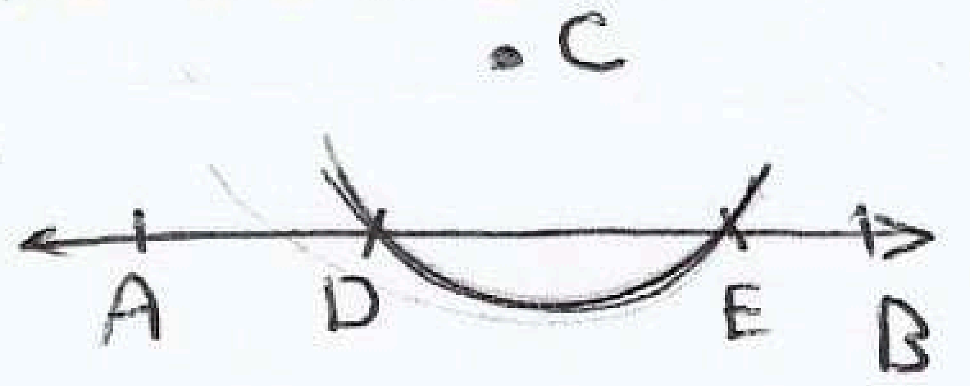
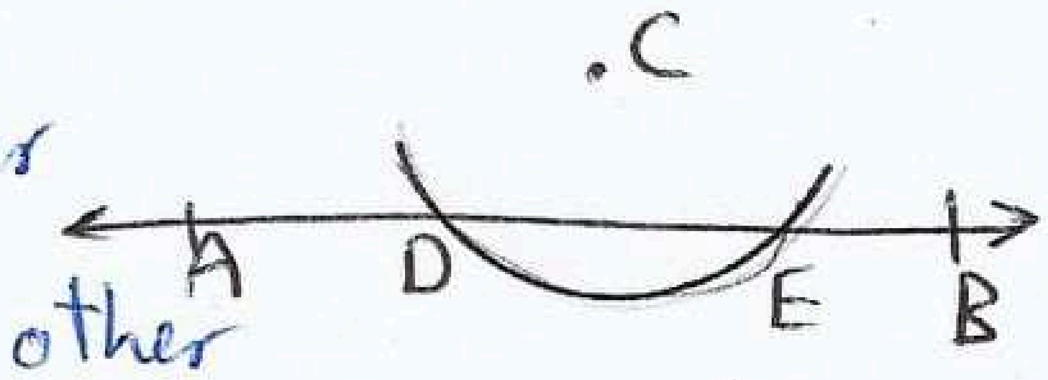
4 Geometric constructions

① Drawing a perpendicular from a point outside a straight line:

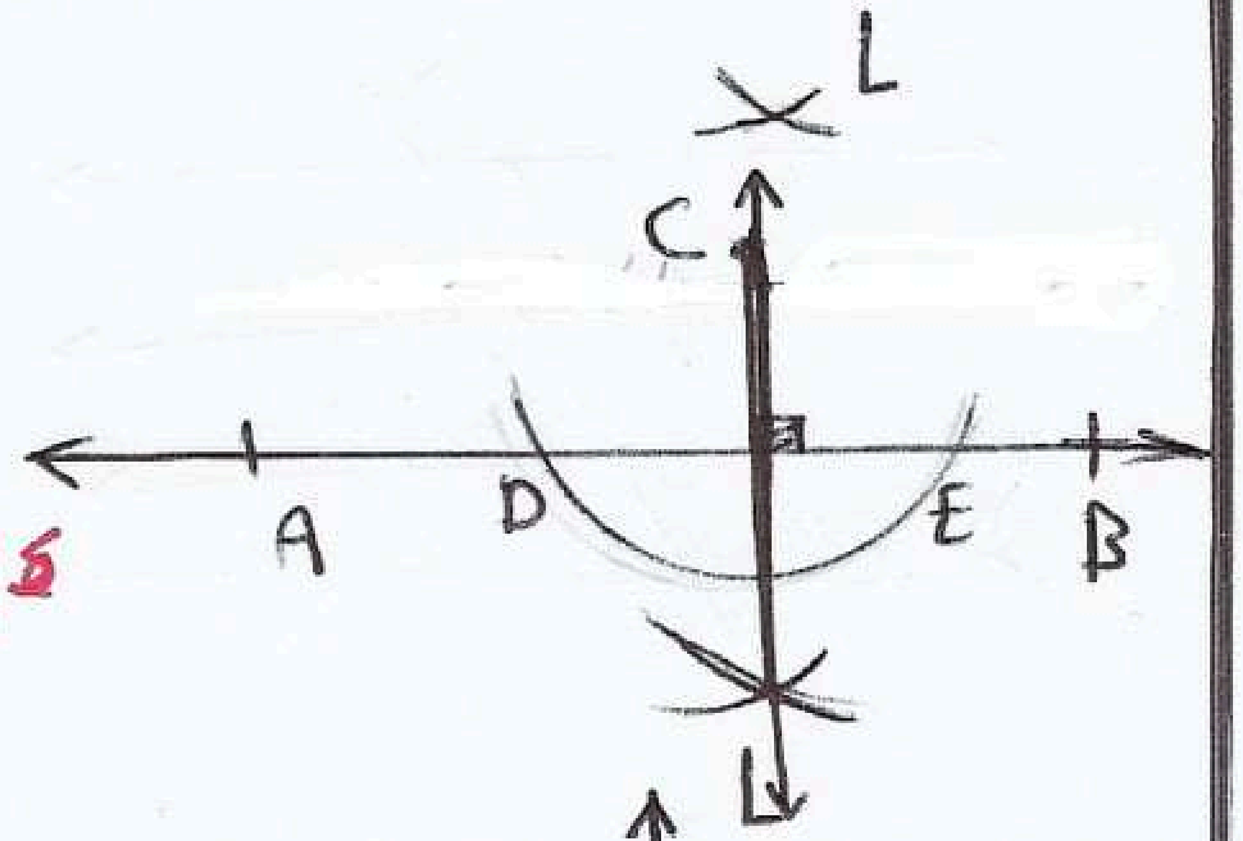
① using the compasses at C as a centre and with a suitable radius draw an arc to intersect $\overleftrightarrow{AB}$ at the two points D and E



② At D and E as a centre with a radius greater than $\frac{1}{2}$ DE draw two arcs to intersect each other at L



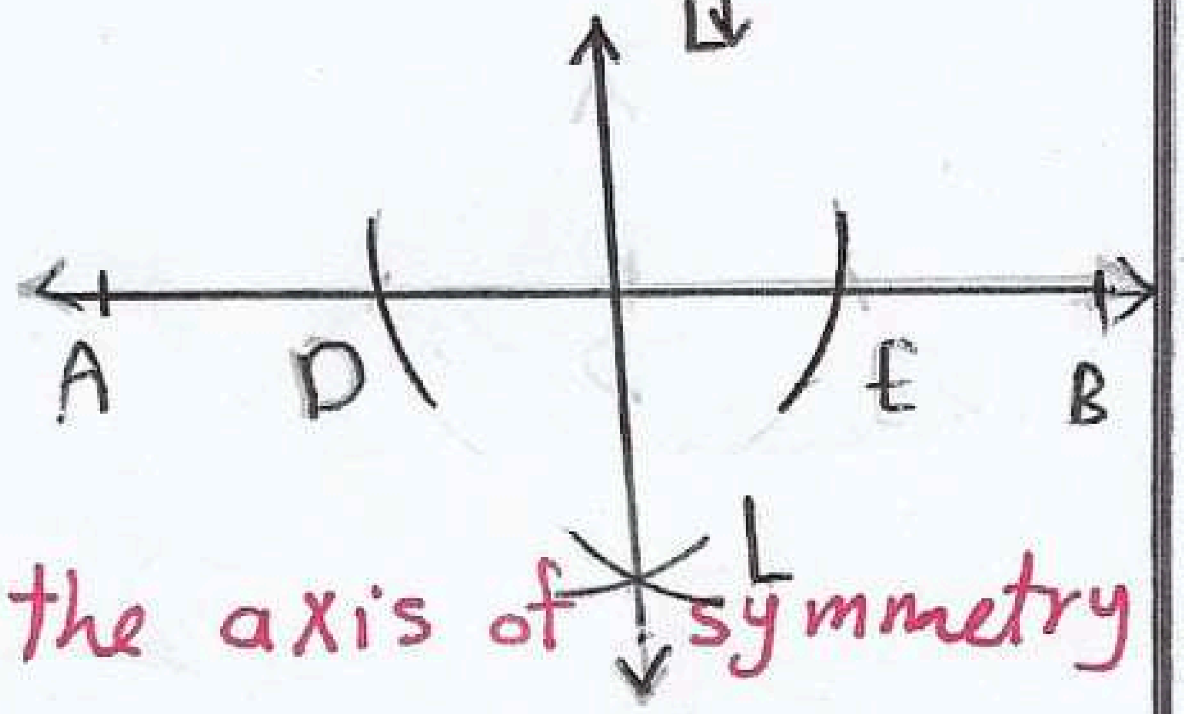
③ Draw $\overleftrightarrow{CL}$



② Drawing a perpendicular from a point belongs to the straight line

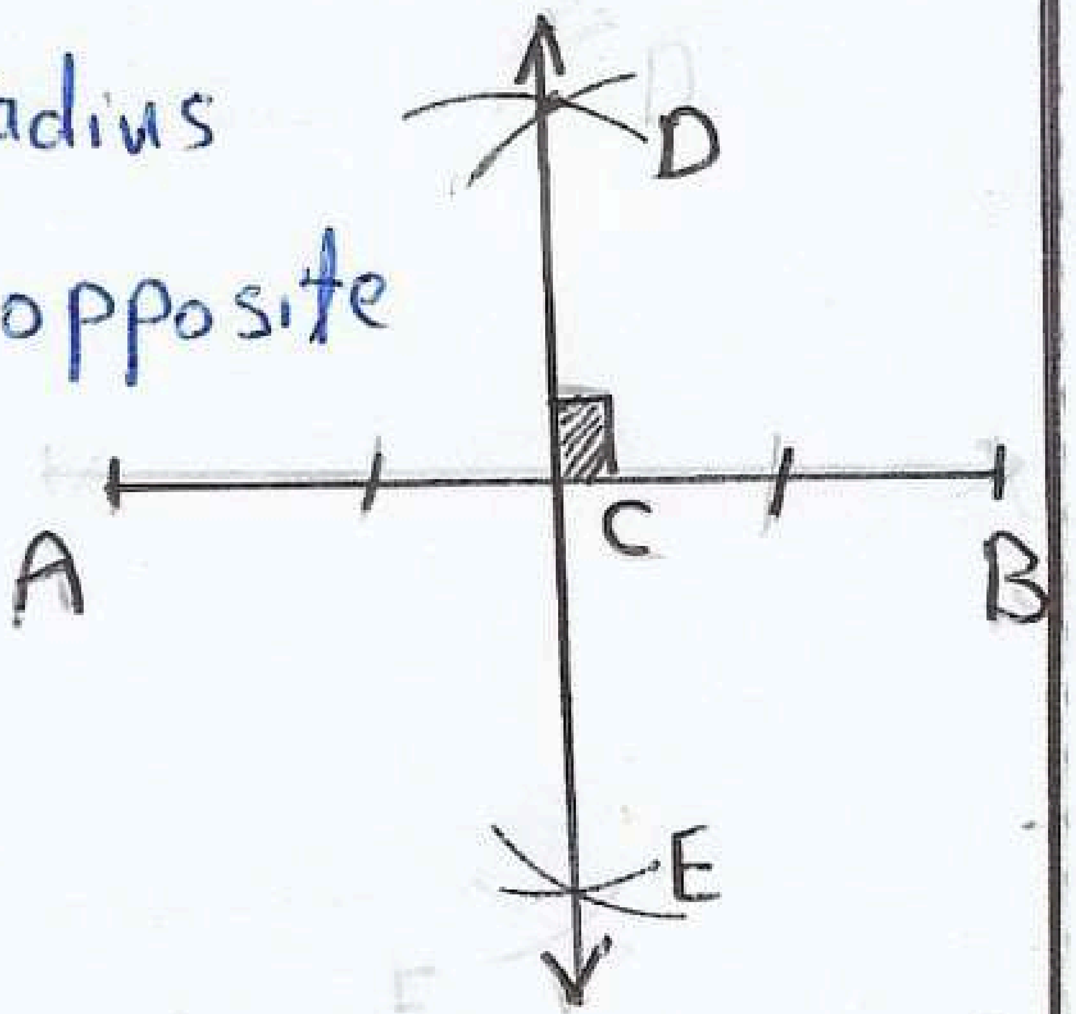
$\overleftrightarrow{AB}$ is given and $C \in \overleftrightarrow{AB}$

We do the same steps



③ Bisecting a given line segment or drawing the axis of symmetry

① using the Compasses at A as a center with a radius greater than $\frac{1}{2}$ AB draw two arcs in the opposite side of $\overline{AB}$



② Do the same step at B

③ Draw $\overleftrightarrow{DE}$ to cut $\overline{AB}$ at C

C is the midpoint of $\overline{AB}$ and $\overleftrightarrow{DE} \perp \overline{AB}$

The axis of symmetry of a line segment:
it is the straight line perpendicular to it from its midpoint

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4 Constructing the bisector of a given angle.

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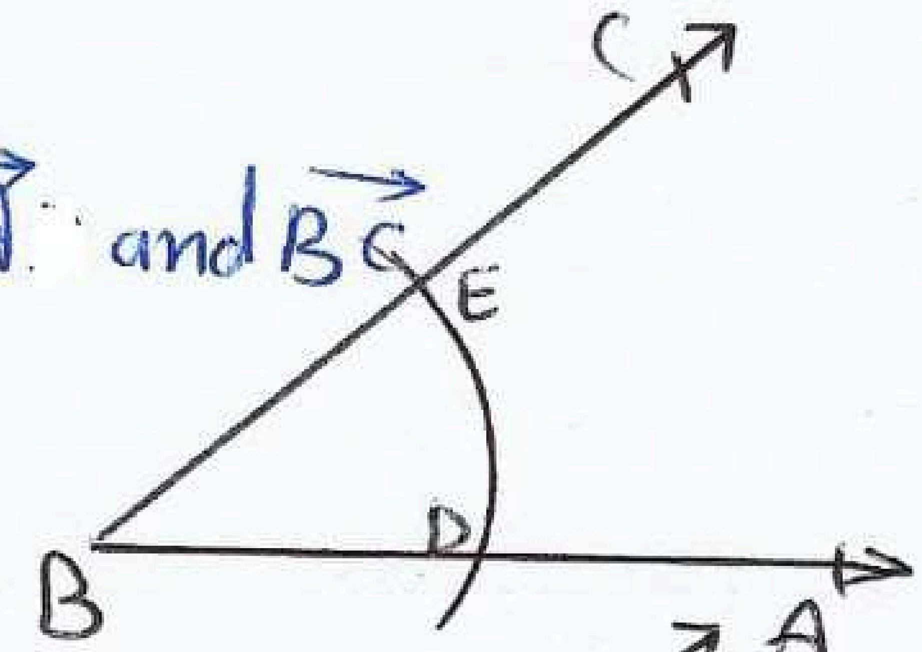
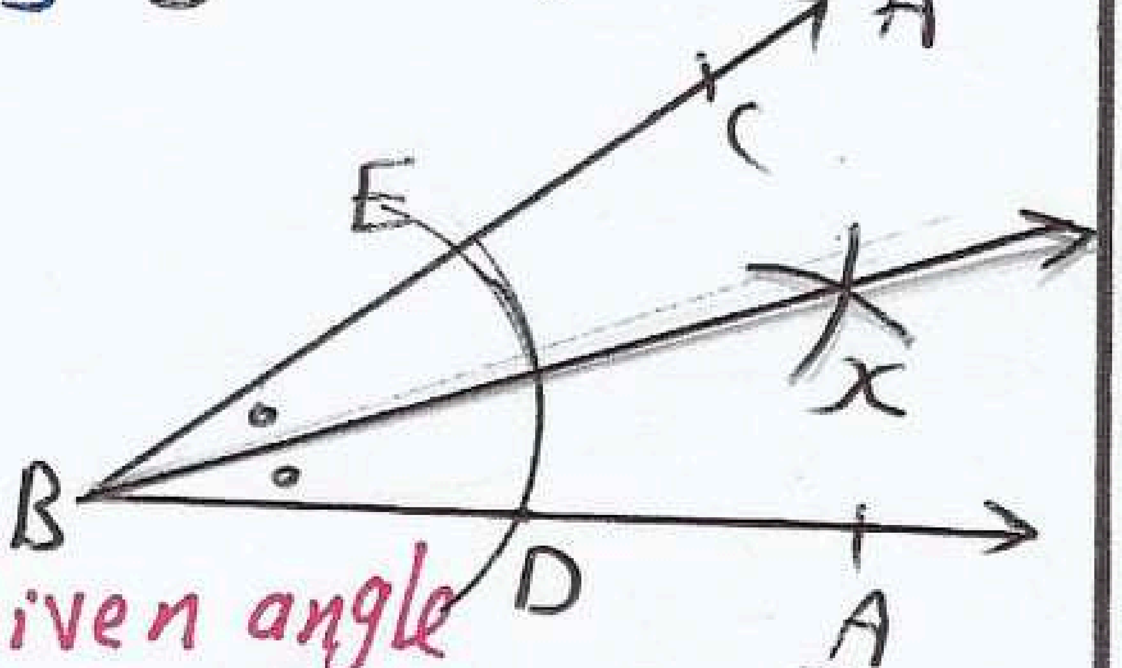


① taking B as a center, draw an arc intersect $\overrightarrow{BA}$ and $\overrightarrow{BC}$ at D and E

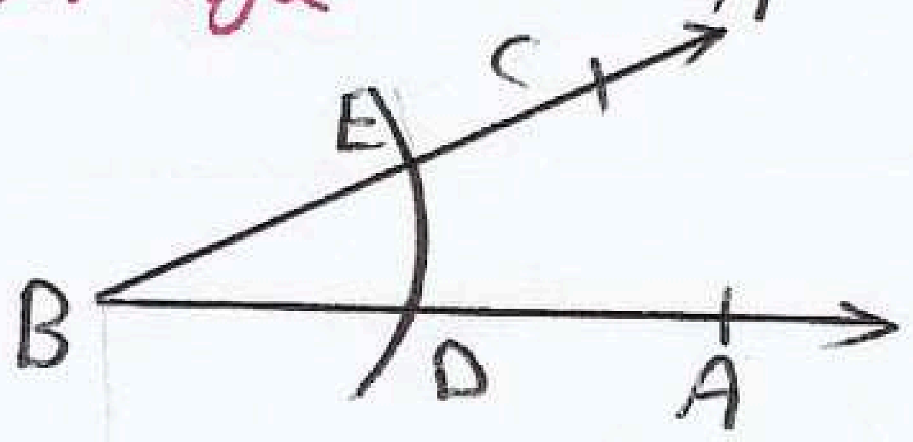
② taking D and E as centres draw two arcs intersect at the point x



③ Draw $\overrightarrow{Bx}$ to be the bisector of $\angle ABC$

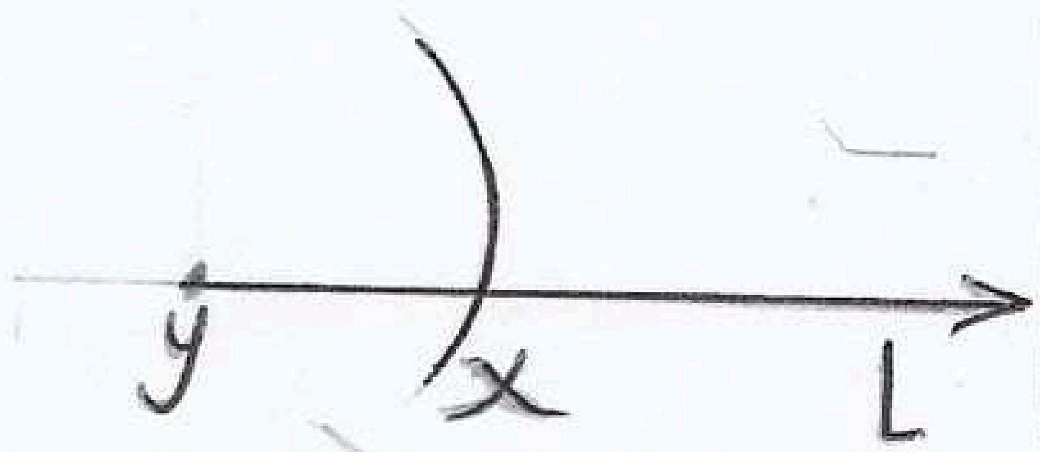
5 Constructing an angle to be congruent to a given angle

$\angle ABC$ is a given angle

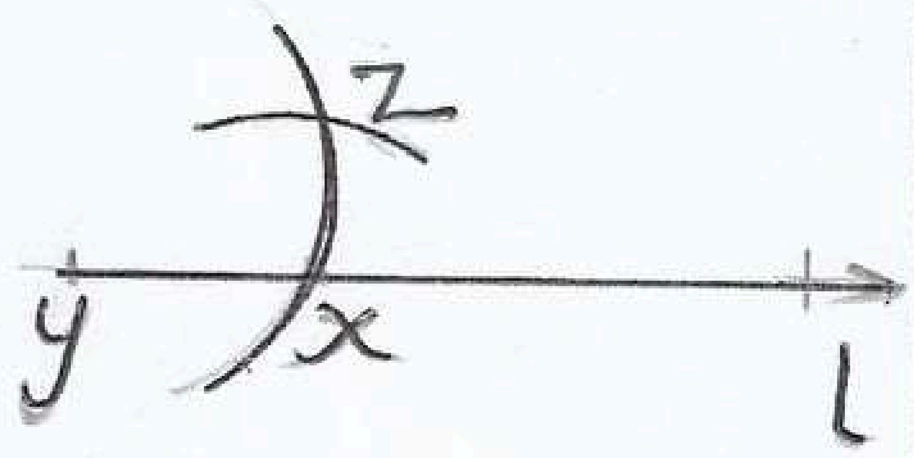


① Draw $\overrightarrow{YL}$ as one side of the angle

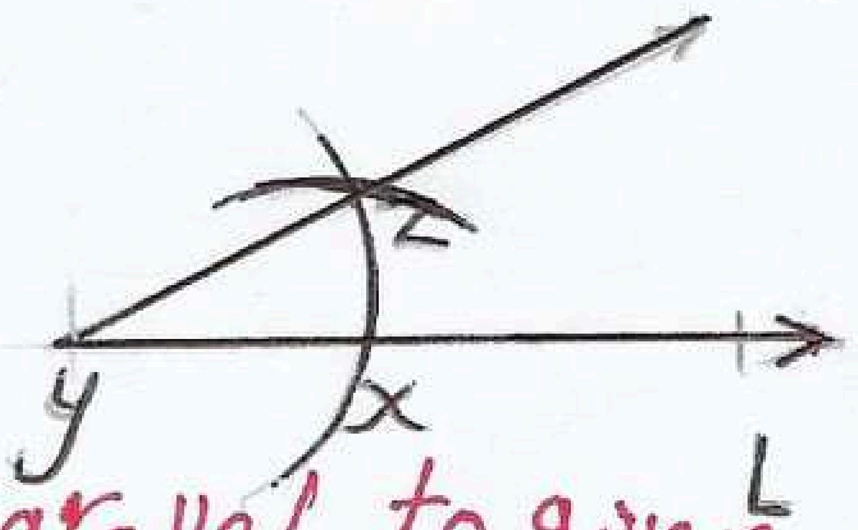
② taking B as a centre draw an arc intersect $\overrightarrow{BA}$ and $\overrightarrow{BC}$ at D and E



③ with y as a centre and with the same radius draw an arc cut $\overrightarrow{yL}$ at x



④ with x as a centre and with radius equal the length of $\overline{DE}$ draw another arc to cut the previous arc at z

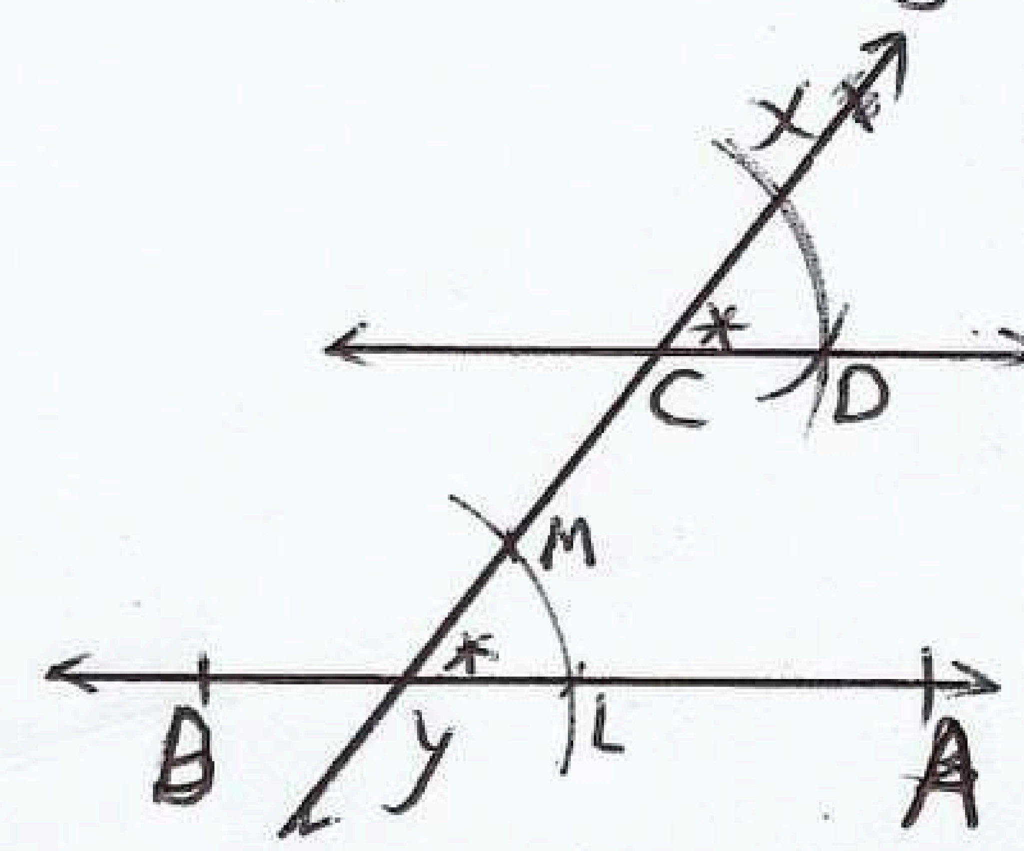


⑤ draw $\overrightarrow{yz}$

6 Drawing a straight line from a given point parallel to given straight line.

$\overleftrightarrow{AB}$ is a given straight line and $C \notin \overleftrightarrow{AB}$

① draw $\overleftrightarrow{xy}$ passing throug the point C and cutting $\overleftrightarrow{AB}$ at y



② draw at C the angle XCD corresponding to $\angle AYX$, $\angle XCD \equiv \angle XYA$ using the previous construction then $\overleftrightarrow{CD} \parallel \overleftrightarrow{AB}$

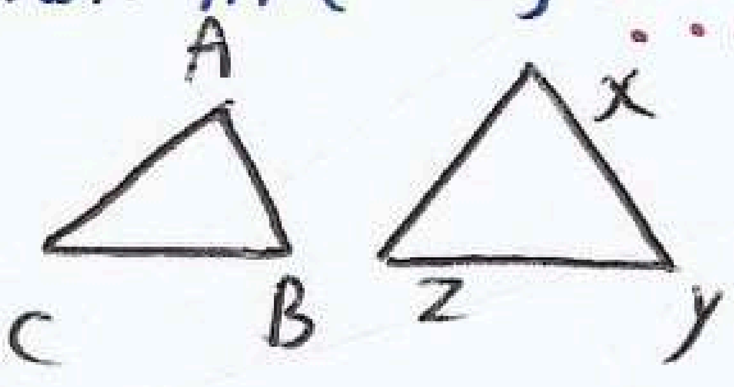
Model 1

I Complete each of the following:

① The perpendicular bisector of a line segment is called ....

axis of symmetry.

② If $\Delta ABC \equiv \Delta XYZ$, $m(\angle A) + m(\angle B) = 140^\circ$ then $m(\angle Z) =$ .....



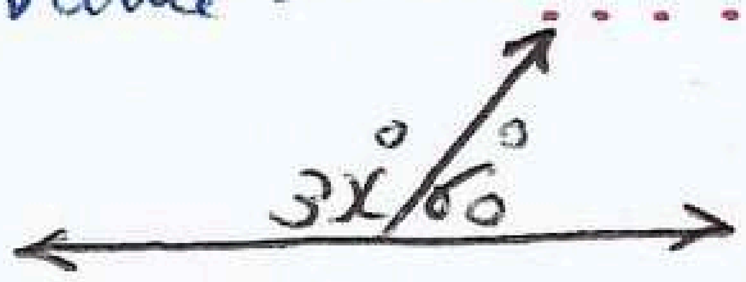
$m(\angle C) = 180 - 140 = 40^\circ$

since $\Delta ABC \equiv \Delta XY2$ then $m(\angle Z) = m(\angle C) = 40^\circ$

③ If $m(\angle B) = 105^\circ$, then $m(\text{reflex} \angle B) =$ ....

$m(\text{reflex} \angle B) = 360 - 105^\circ = 255^\circ$

④ If $\overrightarrow{MB} \cap \overleftrightarrow{AC} = \{m\}$, $m(\angle AMB) = 60^\circ$, then the value of $X =$ .....



$3X = 180^\circ - 60^\circ = 120^\circ$, then $X = \frac{120}{3} = 40^\circ$

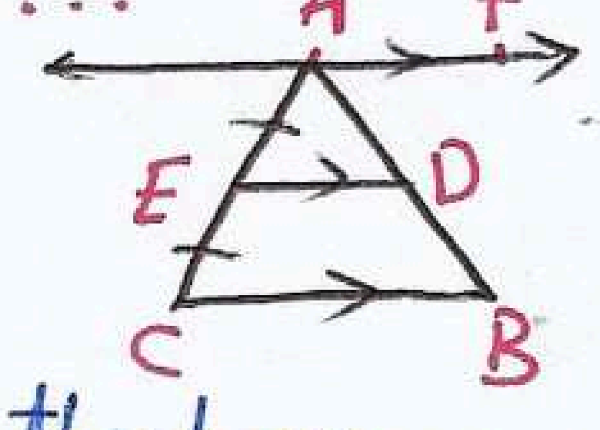
⑤ Two right-angled triangles are congruent if ....

the hypotenuse and aside of one triangle are congruent to the corresponding parts of the other triangle.

⑥ If $\angle x \equiv \angle y$, $\angle x$ and $\angle y$ are supplementary angles, then $m(\angle x) =$ ....

$m(\angle X) + m(\angle y) = 180^\circ$ then $m(\angle X) = m(\angle y) = \frac{180}{2} = 90^\circ$

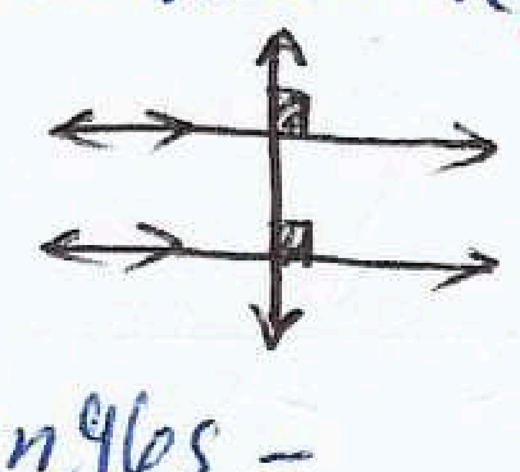
⑦ $\overleftrightarrow{AF} \parallel \overleftrightarrow{DE} \parallel BC$, $AE = EC$, then $AD : AB =$ .... : ....



$AD = DB$ then $AD : AB = 1 : 2$

⑧ The two straight lines that are perpendicular to a third one are .....

Parallel



⑨ The measure of each of two equal complementary angles = ...

$m(\angle X) + m(\angle X) = 90^\circ \Rightarrow m(\angle X) = \frac{90}{2}^\circ = 45^\circ$ $\quad 45^\circ$

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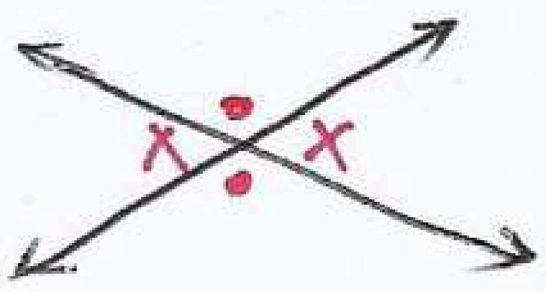
10 If two straight lines intersect, then each two .... angles have the same measure   vertically opposite

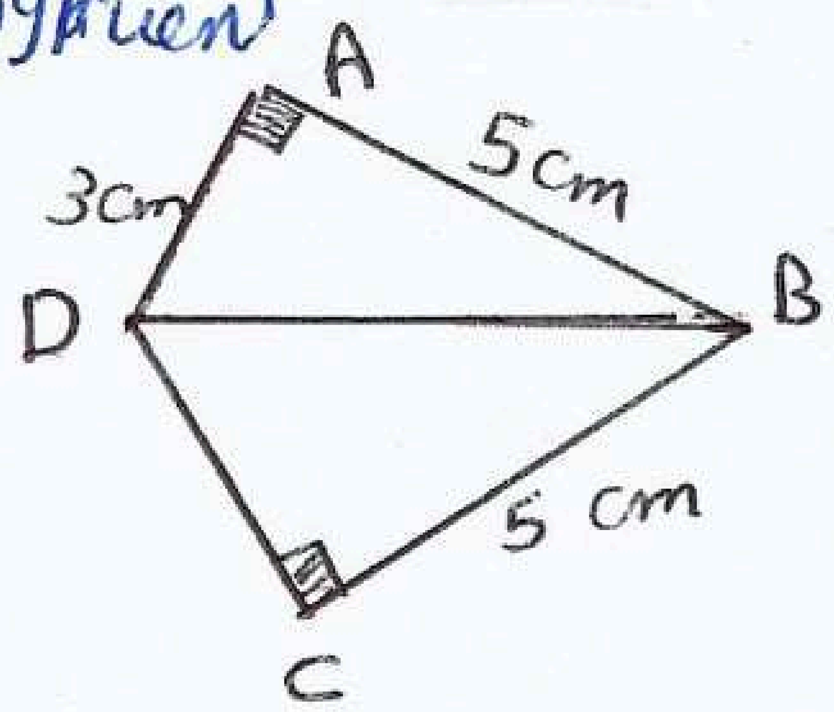


11 If $\Delta ABC \equiv \Delta LMN$, then $m(\angle ACB) = m(\angle ......)$

$m(\angle ACB) = m(\angle LNM)$

2 In the opposite figure:

mention the Conditions for ΔABD , ΔCBD to be Congruent then find the length of $\overline{CD}$



Solution

In ΔABD and ΔCBD

① $m(\angle C) = m(\angle A) = 90^\circ$ R

② $\overline{BD}$ is a common hypotenuse   H

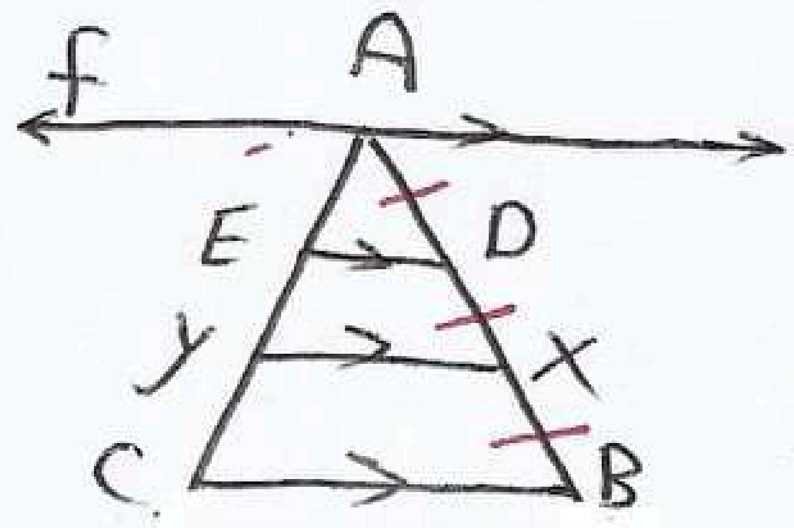
$AB = CB$ S

Then $\Delta ABD \equiv \Delta CBD$

Then $CD = AD = 3\,cm$

6 in the opposite figure. $AC = 9\,cm$

Find the length of $\overline{Ay}$ give the reason



Solution

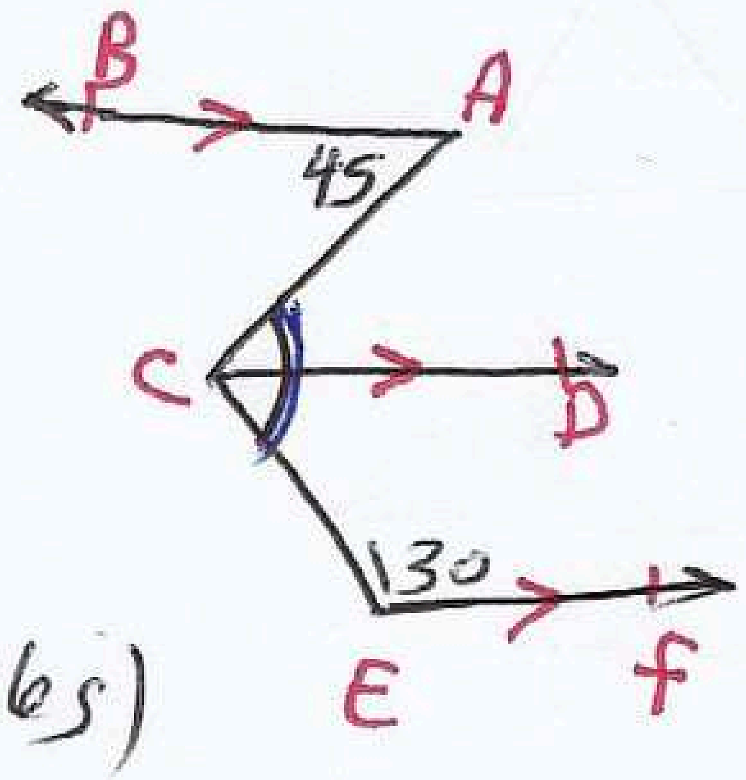
since $\overrightarrow{Af} \parallel \overline{DE} \parallel \overline{Xy} \parallel \overline{BC}$

and $AD = DX = XB$

Then $AE = Ey = yC = \frac{9}{3} = 3\,cm$, then $Ay = 3+3 = 6\,cm$

4 In the opposite figure

Find $m(\angle ACE)$



Solution

since $\overrightarrow{AB} \parallel \overrightarrow{CD}$

Then $m(\angle A) = m(\angle ACD) = 45^\circ$ (alternate angles)

since $\overrightarrow{CD} \parallel \overrightarrow{Ef}$

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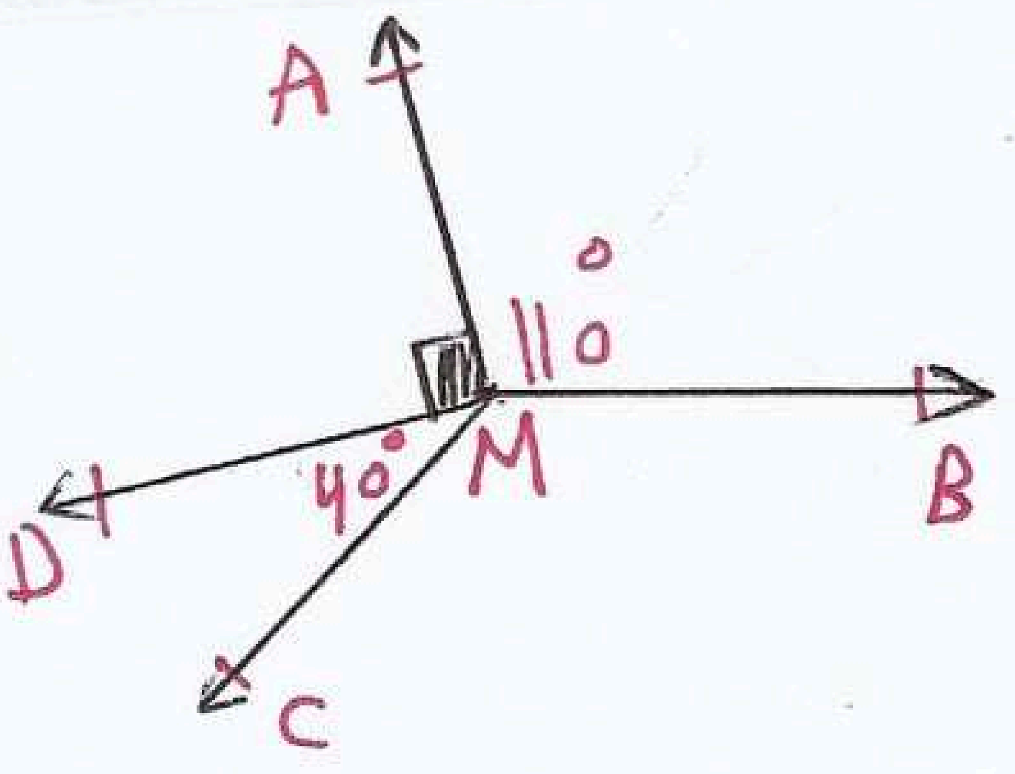
Then $m(\angle DCE) + m(\angle E) = 180$ interior angles

$m(\angle DCE) = 180 - 130 = 50^\circ$, then $m(\angle ACE) = 45+50 = 95^\circ$

(b) In the opposite figure

Find with steps m(<BMC)



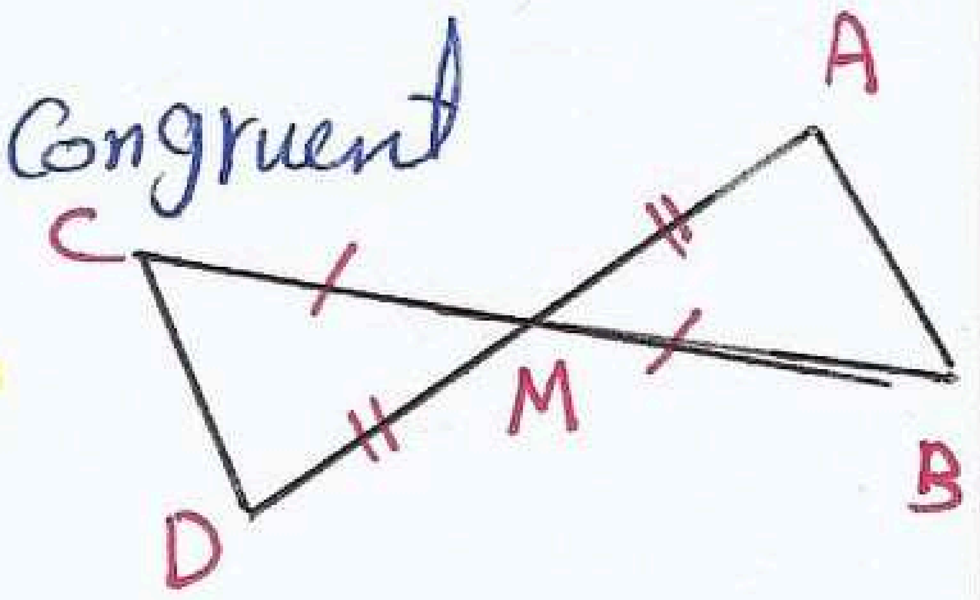
Solution

Sine sum of measures of accumulative angles at point M is $360°$

Then $m(\angle BMC) = 360 - (110° + 90° + 40°) = 120°$

(5) (a) In the opposite figure

write the conditions for $\triangle AMB$, $\triangle DMC$ to be Congruent



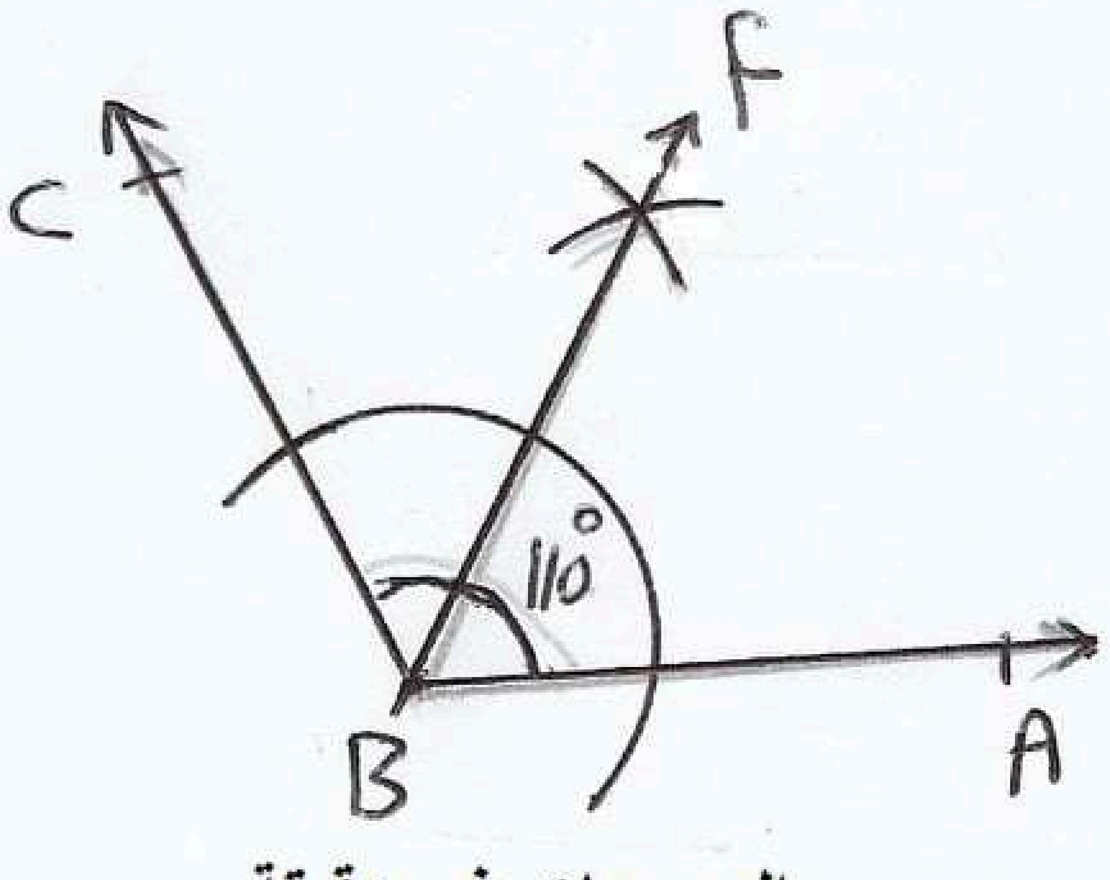
Solution

In $\triangle\triangle AMB, DMC$

$$\begin{cases} AM = DM \\ m(\angle AMB) = m(DMC) \quad (V \cdot O \cdot A) \\ BM = CM \end{cases}$$

Then $\triangle AMB \equiv \triangle DMC$

(b) Using the geometric instruments, draw < ABC of measure $110°$, then draw $\overrightarrow{BF}$ to bisect the angle.



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I Complete each of the following **Model 2**

① The sum of the measures of the accumulative angles at a point $= 360^\circ$

② If a straight line intersects two parallel straight lines, then each two corresponding angles are equal in measure.

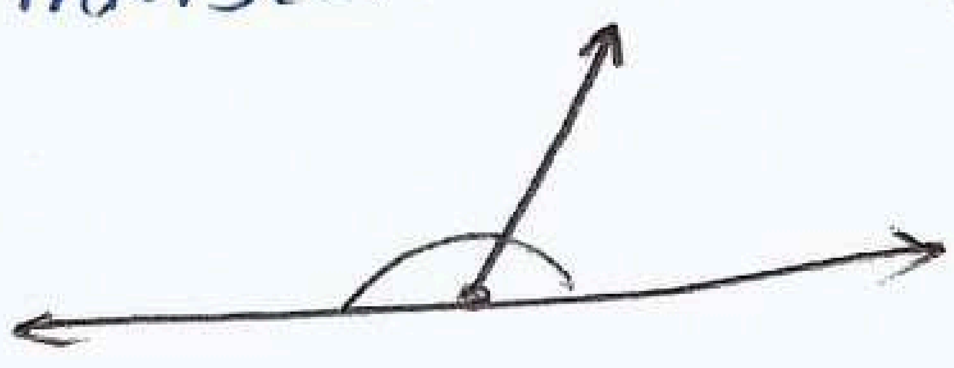
③ If $m(\angle A) = 110^\circ$ then $m($ reflex $\angle A) = \ldots\ldots$

$360 - 110 = 250^\circ$

④ Two right angled traingles are congruent if ......

hypotenuse and a side of one triangle are congruent to the corresponding parts of the other triangle

⑤ The two adjacent angles formed by the intersection of a straight line and a ray are .... supplementray



⑥ If $\angle x$ complements $\angle y$ and $\angle x \equiv \angle y$ then $m(\angle x) = \ldots\ldots$

$m(\angle x) + m(\angle y) = 90 \quad \therefore m(\angle x) = m(\angle y) = \frac{90}{2} = 45^\circ$

⑦ The number of triangle in the Figure  equals 8

⑧ If the ratio between the measures of two supplementray angles is 5:13, then the measure of the smaller angles equals ......

1^{st} angle : 2^{nd} angle : sum

supplementray $\Rightarrow$ 1^{st} angle $+ 2^{nd}$ angle $= 180$

$5 : 13 : 18$

$? : \quad : 180 \rightarrow$ smaller angles $= \frac{\overset{10}{\cancel{180}} \times 5}{\underset{1}{\cancel{18}}} = 50^\circ$

⑨ $\triangle ABC \equiv \triangle XYZ$, $m(\angle A) + m(\angle B) = 100$ then $m(\angle Z) = \ldots$

$m(\angle Z) = m(\angle C) = 180 - 100 = 80^\circ$

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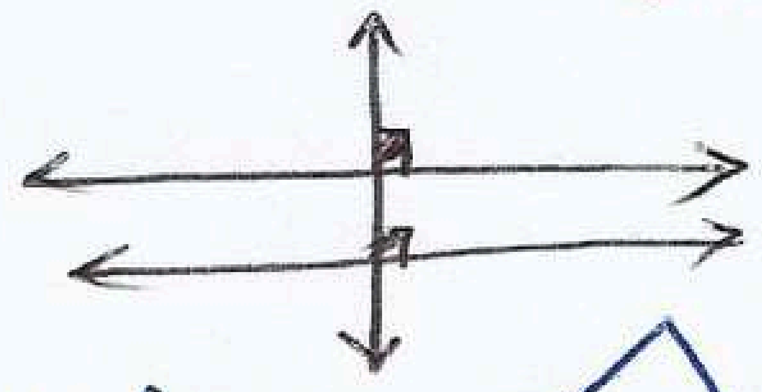
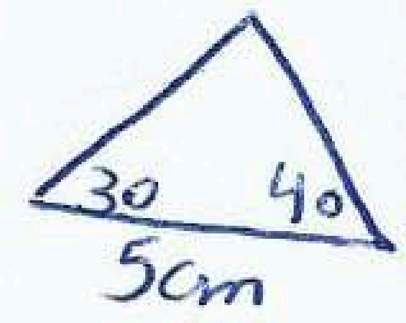
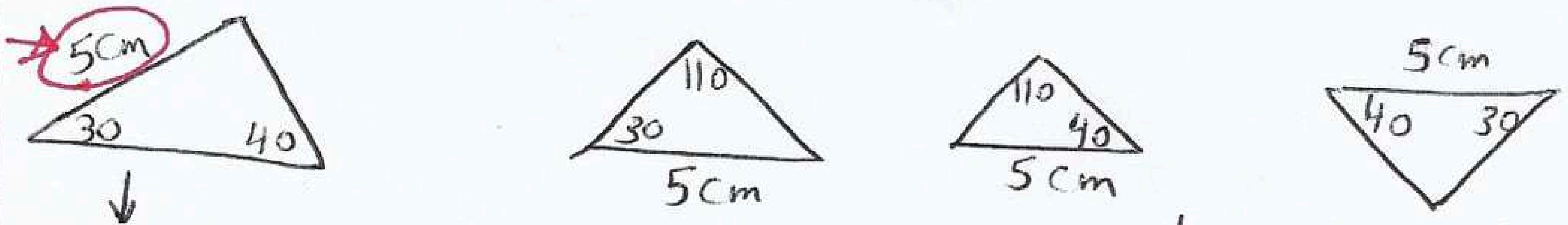
⑩ The two straigh lines that are perpendicular to a third one are ......

Parallel



⑪ The figure .... is not congruent to the opposite figure





not congruent   congruent   Congruent   congruent

[3] ⓐ mention two cases of congruent of two triangles

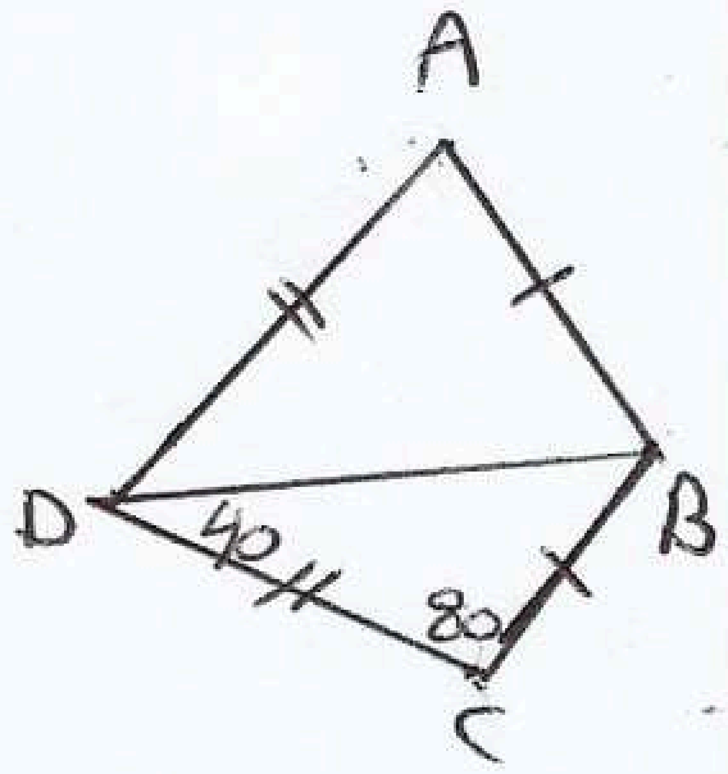
S-A-S

① two triangles are congruent if two sides and the included angle of one triangle are congruent to the corresponding ports of the other triangle

② two triangles are congruent if each side of one triangle is congruent to the corresponding side of the other triangle S-S-S

ⓑ In the opposite figure

Prove that $\Delta CBD \equiv \Delta ABD$ and find $m(\angle ABD)$



Solution

In ΔCBD and ΔABD

$AB = CB$ (S)

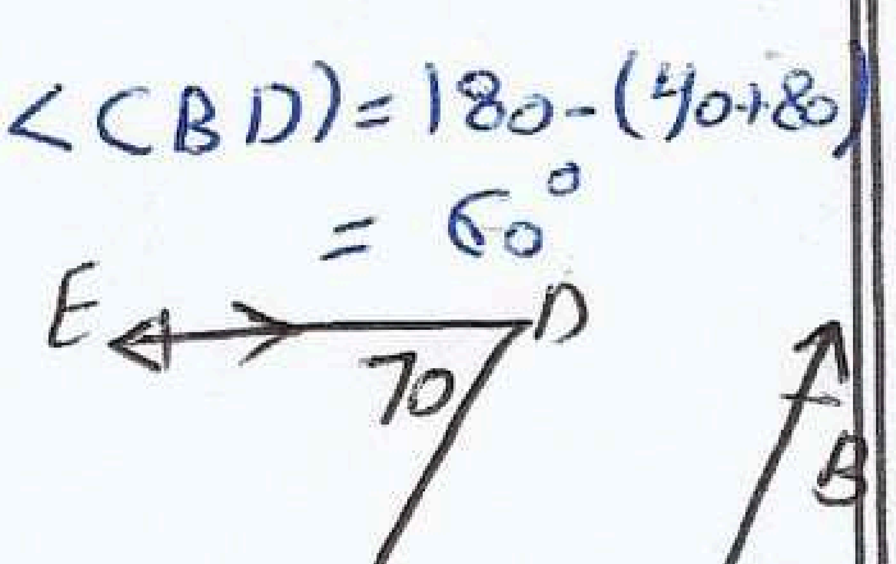
$AD = CD$ (S)

DB is a Common side (S)

Then $\Delta CBD \equiv \Delta ABD$ then $m(\angle ABD) = m(\angle CBD) = 180 - (40+80)$
$= 60^\circ$

④ ⓐ In the opposite figure find $m(\angle C)$

is $\overrightarrow{AB} \parallel \overrightarrow{CD}$



Solution

⇒ Sinc $\overrightarrow{DE} \parallel \overline{CA}$ and $\overline{DC}$ transvesal to them

Then $m(\angle C) = m(\angle D) = 70$ (Alternate angles)

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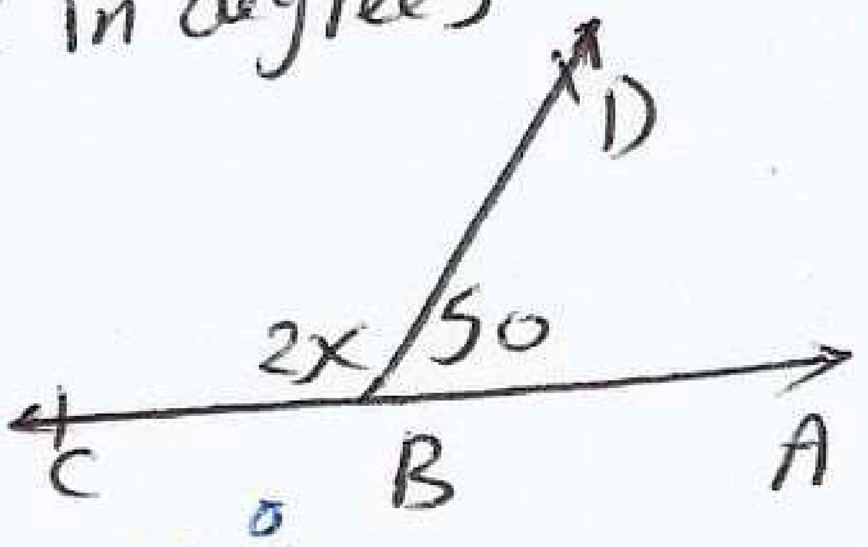
⇒ Sinc $m(\angle C) + m(\angle A) = 70 + 110 = 180$ two interior angles

Then $\overrightarrow{AB} \parallel \overrightarrow{CD}$

(b) using the geometric instruments draw $\angle ABC$ where $m(\angle B) = 80^\circ$ then draw $\overrightarrow{BD}$ to bisect it (Don't remove the arcs)

try by yourself.

(5a) In the opposite figure. find the value of x in degrees

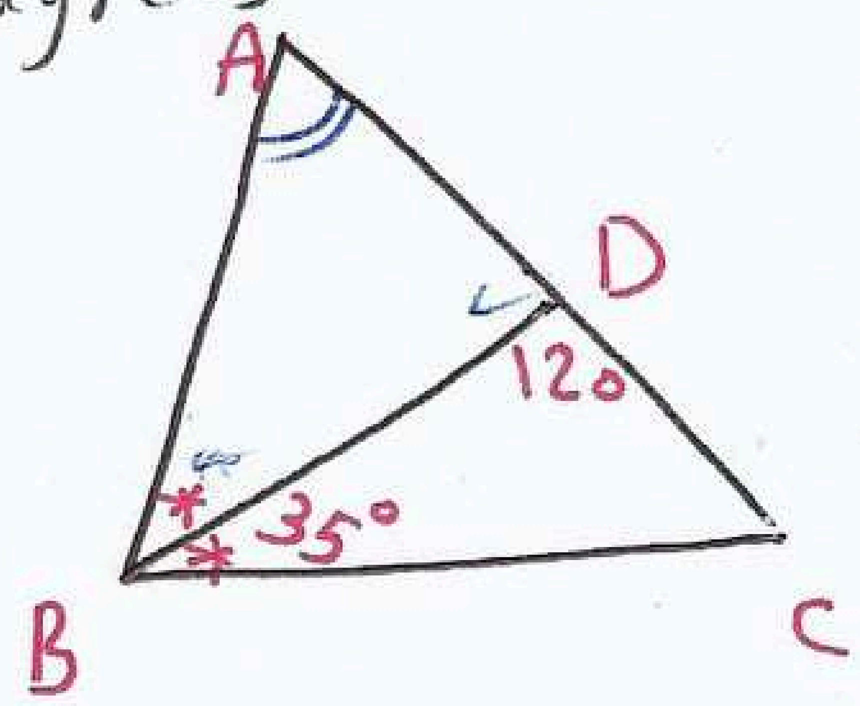


Solution

$m(\angle ABD) + m(\angle DBC) = 180$

Then $2x = 180 - 50 = 130$. then $x = \frac{130}{2} = 65^\circ$

(b) In the opposite figure find $m(\angle A)$ in degrees.



Solution

Since $\overrightarrow{BD}$ bisects $\angle ABC$

Then $m(\angle ABD) = 35^\circ$

$m(\angle ADB) = 180^\circ - 120^\circ = 60^\circ$

In $\triangle ABD$ $m(\angle A) = 180 - (35^\circ + 60) = 85^\circ$

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بالتوفيق